EXTENSION EDUCATION INSTITUTE
NILOKHERI

BUILDING AND IMPLEMENTING PROBLEM ORIENTED EXTENSION PROGRAMMES

WORKSHOP

for

PROFESSORS OF EXTENSION
DIRECTORS OF INSERVICE TRAINING
AND OFFICERS-IN-CHARGE, REFRESHER
TRAINING UNITS

organised by

DIRECTORATE OF EXTENSION
MINISTRY OF FOOD, AGRICULTURE, C.D. & COOPERATION
GOVERNMENT OF INDIA
AND U.S.A.I.D.

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BUILDING AND IMPLEMENTING PROBLEM ORIENTED EXTENSION PROGRAMMES

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INTRODUCTION

Two work seminars for twelve days each were organised jointly by the Directorate of Extension and United States Agency for International Development at the Extension Education Institute, Nilokheri on "Building and implementing problem oriented Extension Programmes". Sixteen professors and lecturers of Extension of Agricultural and Animal Husbandry Colleges and Universities from the States of Andhra Pradesh, Bihar, Gujarat, Punjab and Uttar Pradesh attended the first seminar. The second was organised for officers-in-charge of the Refresher Training Units at the Gramsevak Training Centres, in which 26 participants mostly Principals from the States of Andhra Pradesh, Gujarat, Himachal Pradesh, Jammu & Kashmir, Kerala, Madras, Maharashtra, Mysore, Orissa, Punjab, Rajasthan and Uttar Pradesh attended. Dr. S.R. Barooah, Director of Extension inaugurated the courses while Dr. T.R. Mehta, Director of the Farm Advisory Unit designed the subject matter content alongwith Dr. Harrison Taylor of the U.S.A.I.D. Mr. G.G. Gibson, and Mr. James Crosby, Extension Training Advisers, U.S.A.I.D. attached to the Directorate of Extension contributed to the plan and method of approach to be followed at the seminar.

PURPOSE

Developing professional competence at the Block and District level for agricultural extension workers has always been the main object of any training programme. In the past, several attempts have been made to equip the Agricultural and Animal Husbandry Extension Officers by organising one month subject matter courses at the

Agricultural & Animal Husbandry Colleges and Universities. The primary objective of these courses was to increase the proficiency of their extension workers and to improve their professional competence by acquainting them with the latest developments in their respective technical fields. The experience gained in the past years after training several thousand extension officers has shown that the treatment of this course by the colleges needs a more practical slant in order to increase the competency of these field workers in applying Extension methods to a practical situation.

The main purpose of this seminar has been to experiment with the problem oriented approach. As the primary function of Extension is to help farmers identify their problems, to help them find out solutions to these problems and to provide them the required technical know how with information of supplies, this seminar aims at 'building and implementing problem oriented extension programmes'. An attempt has been made to integrate subject matter with extension in such a way as to help the participants to get a clear picture of various factors involved in programme planning.

Instead of the usual routine that is followed in training programmes of first giving the theoretical framework, discussing the subject-matter in the class-room and then sending the groups to the villages, the process has been reversed by first sending the participants to the village to identify problems in a real situation. The required data and statistics of the villages were collected beforehand and supplied to each group to get them oriented with the structure of the rural society as well as the factors connected with agricultural production. After visiting the villages, the groups discussed the plan in the seminar in detail. As a base for the seminar, soil was

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considered the main problem and alongwith it the various operations of land preparation, fertilizer use, irrigation and crops. Through series of visits the groups were brought closer to the progressive farmers which helped them to get better acquainted with the existing problems in the villages. In each visit different subject matter areas were brought into focus. For example pits were dug in different soil textures in order to provide a study of the soil profile.

In the programme time was allotted to the group to get acquainted with the essential elements of an extension programme and a plan of work. Sample outlines were presented to them. A specific crop of the area was selected in order to make the application of the subject-matter knowledge more meaningful. The participants were exposed to the principles of learning and motivation and the techniques of laying out result demonstrations. Through practicals on the campus, each participant developed the skill of laying out result demonstrations. By organising a 'Farmers Day' each participant was able to demonstrate and convince the progressive farmers the application of new techniques and package of practices. The economics of growing these crops and methods to increase farm income were highlighted. At the end of the village visits and after the presentation of the related subject-matter the sub-groups were given the assignment of preparing a plan of work for selected crops in the villages they had visited.

The main feature of this workshop has been the combined efforts of the specialists and the participants in the various fields of agriculture and extension. Soils have been dealt with very elaborately including land management, use of fertilizers, evaluation of soil and water conservation, good seed and improved agricultural

implements. In programme planning the elements of problem solving, plan of work and programme execution have been covered. In extension teaching methods the groups were exposed to the principles of learning and motivation, effectiveness of extension methods, laying out of result demonstrations and the effective use of extension methods. Emphasis has been given to sugarcane including a few other selected crops.

In the second part of this seminar the officers-in-charge of inservice training programmes were given the opportunities of discussing the syllabus and its treatment in refresher training courses for senior village level workers. In this process these responsible trainers were able to assess and evaluate the methods already followed in the training centres and to come to general conclusions to improve the quality of training.

This new experiment has been successful in bringing the College teaching staff closer to the field staff in examining the new problem oriented approach. This attempt has been very effective in applying subject-matter knowledge to real situations and to plan practical programmes taking into consideration the problems existing in the villages.

In this booklet which has been badly delayed the efforts of the groups as well as the presentations of the subject-matter specialists have been included. It is hoped that the methodology used in this workshop could serve as guidelines to those interested in improving the techniques of training.

This effort has been successful because of the cooperation and contribution of specialists from different agencies. We are grateful to the U.S.A.I.D., and their

Extension Advisors, the Ford Foundation, the Agricultural Colleges and Universities, the State Governments and the Directorate of Extension for having conducted this seminar at this Institute.

H.W. Butt
Principal

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BUILDING AND IMPLEMENTING PROBLEM ORIENTED EXTENSION PROGRAMMES

A work Seminar organized jointly by the Directorate of Extension and U.S. A.I.D. at the Extension Education Institute, Nilokheri January 3-14, 1964

1st Day :

Dr. T. R. Mehta, Director, Farm Advisory Unit, Directorate of Extension was chairman of the opening session. Dr. H.W. Butt, Principal, EEI, Nilokheri gave the welcome address. Dr. S.R. Barooah, Director of Extension Training inaugurated the Seminar.

Problems in Extension Training:

Seminar participants presented their problems relating to the subject of the seminar.

Discussion of Seminar Plans:

The purpose of the seminar was to apply subject matter and extension techniques in solving actual problems of the farmers in the area. Due to time limitation, only problems relating to soil productivity were considered. The seminar included problem identification, application of subject matter, developing a format for problem based on Extension programme and plans of work. Special emphasis was placed on result of demonstrations as a basis for building effective extension education programme. The group organized and held a farmers field day.

2nd Day :

Visit to Village Farming Area :

This field trip was to sharpen techniques of problem identification through field observations and discussion with village leaders.

Elements of Problem Solving in Extension Programmes:

This discussion brought the essential elements in solving problems of farmers into proper perspective. The elements considered were the extension worker, the cultivator, technology, communications, services and supplies. This was followed by group discussion.

Review of problems noted on Visit to Village Farming Area:

The participants reviewed their discussions with the cultivators in the village and their observations in the cultivators' fields. Problems were identified.

A feature of the field visit was the study of soil profiles by means of pits 4' in depth. Three pits in different soil types provided an opportunity for participants and villagers to observe soil conditions, and plant root penetration.

3rd Day :

Developing the Extension Programme :

This item emphasized that a worthwhile extension programme must be based on recognized problems of farmers; that the people concerned must be involved in the programme building process from the beginning; that the programme should be written so as to be available for reference when required. A sample programme format was developed.

Groups visit assigned villages :

Participants were divided into two groups and each group assigned to visit a village. The purpose of this village visit was for to participants to obtain definite information on problems and what the villagers would like to do about them. Discussions were held with village leaders, soil borings were made, fields were visited to observe growing crops and soil conditions. One member of the

EEI staff was assigned to serve as a consultant to each group.

Following the visit to the village each group was asked to prepare a brief report setting forth their observations and the problems observed.

4th Day :

Developing an outline for the Extension Programme :

A sample outline for use in writing an extension programme was prepared.

Developing a plan of work:

Consideration was given to purposes, guiding principles, content, and organization.

Since the Village Level Worker and the Agricultural Extension Officer have responsibility for implementing a plan of work, an attempt was made to develop the kind of a format that would be useful to extension workers at village and block levels.

5th Day :

Meeting the Requirements for technical subject matter:

This included consideration of reliability, availability when and where needed and applicability to specific problems.

To make the seminar more meaningful to the participants, sugarcane an important crop of the area was selected as the problem for subject matter application. Attention was given to providing the required subject matter and the development of skills and application through demonstrations.

6th Day :

Continuation of subject matter discussion and application to selected problem.

7th Day : OPEN. SUNDAY

8th Day :

Putting knowledge to work in the villages:

(a) This included a consideration of applicable principles of learning and motivation, (b) the role of extension methods in the transfer of knowledge and using extension methods that suit the local situation.

The process of effective communications was demonstrated through the presentation of a practical problem involved in laying the sugarcane demonstration. This involved a neck yoke for bullocks suited to the row spacing for the sugarcane.

Work Group Assignments :

Each group was requested to develop an extension education programme using all methods applicable to the selected problems.

9th Day :

Demonstrations in Extension Education Programme :

The process of implementing a successful result demonstration programme was presented. The subject was the application of fertilizer to raghi under rain-fed conditions in Mysore state. The problems and successes in this demonstration programme were discussed at length with the participants.

Laying Result Demonstrations :

Working in groups, participants either laid or assisted with the laying of a result demonstration. Each demonstration was presented to the group and discussed.

One feature planned for the farmers field day was the planting of sugarcane according to improved methods. One group was assigned the responsibility of making preparations for this feature of the field day programme.

The second group was assigned the responsibility of demonstrating and explaining various implements used in the application of the improved methods.

10th Day :

Preparation for Field Day Programme and visit to research centres.

A field trip was organized to visit research centres and obtain the latest recommendations on sugarcane production. Improved farming methods were studied at the research centres.

Preparation for the farmers field day programme were completed

11th Day :

Increasing Farm Income :

Attention was focused on the economic aspects of applying improved practices. Factors that maximize crop returns were considered.

Field Day programme for Village Leaders :

The programme included a discussion of practices related to increased crop production, a demonstration of growing sugarcane according to recommended procedures and the use of certain farm implements suitable for the area. All demonstrations were conducted by the seminar participants. A feature of the day was the application of irrigation water through furrow method.

12th Day :

The seminar concluded with a review of the programme, an evaluation by the participants of the programme, and a discussion of opportunities for using the problem oriented approach in future training programmes.

INAUGURAL ADDRESS

by

DR. S.R. BAROOAH

Mr Chairman, distinguished Guests and Friends,

India's agricultural situation is well known. Low crop yields plus a growing population is aggravating the already dangerous situation. Food grains imports required to bridge the gap can only be made at the expense of development programmes. Our future and survival as a Democracy is tied to agricultural progress. The Prime Minister stated in his address to the National Conference of Community Development Ministers, "The most important thing is agriculture. Everything else, I repeat, is secondary. Let there be no mistake about that. And, if the State Governments and the Community Development and Panchayati Raj Institutions do not deal with the problem of agricultural production adequately, then everything fails. There are so many other things which are important, but this is the most important. There is no help for us, but to succeed in agricultural production. Keeping this in view, we have to make the individual farmer appreciate it fully as being the most urgent task. You have to make him believe that this is to his advantage. He has succeeded in some measure in the past, but not to the extent that we had hoped and certainly not to the extent that we still hope and to the extent that I am sure he will. That is the most vital thing and all our planning and industrial development depends upon it."

We gain some satisfaction from our agricultural accomplishments. Research has produced some improved

techniques and varieties which have demonstrated their value in practice : Examples are hybrid maize, improved wheat, improved equipment.

Agricultural Education Institutions are providing some excellent technical training. Demonstrations and Extension programmes are helping to put knowledge to work for the farmer and his family. Extension is concerned with the problems of the farmer, his wife, his sons and daughters.

Progress today is not enough. Extension must assume its share of responsibility along with other institutions like research, education, credit, supply and marketing. The Government of India is taking a hard look on all aspects of the production problems with a view to overcome deficiencies. Extension is recognized as one of the keys to the situation. This means that the extension cannot be complacent. The time has arrived when extension must be more concerned with specific problems, the farmer considers important. This means having technical information ready for use on the farm and in the home when it is needed and in a form in which it can be used.

It means developing extension education programmes that make needed information widely available in a convincing form. Extension means more than exposing new information and new methods to the farmer. Extension means positive encouragement for adoption and continued use.

This Seminar represents a different approach to training in extension, through a sharper focus on real problems. Attention will be given to subject-matter with adequate consideration for extension methodology; these will be combined into an extension education programme aimed at solving certain identified problems. Every extension

worker should have one or more fields in which he is technically competent. This is required to help provide a proper perspective of the relationship between subject-matter and extension methods. There must be no gap between subject-matter and methodology. One without the other becomes less effective.

This is an opportunity for extension trainers to take a fresh look at their job with a view to include any changes that will make extension more effective.

We believe that the problem oriented approach can provide the purposefulness required for good extension worker. We have the opportunity and responsibility to develop training programmes that will help extension become a stronger force for improved agriculture and home-making in our country.

Extension is education for action now. The students of extension are the farmers who have problems and who are looking to extension to help provide some answers. We hope this seminar can be the beginning of a clearer focus on solving problems that concerned farmers as individuals and India as a nation.

BUILDING AND IMPLEMENTING PROBLEM ORIENTED EXTENSION PROGRAMMES

DR. T.R. MEHTA
DR. M.H. TAYLOR

Visit to Village Farming Area.

1. *Purpose*: To sharpen techniques of problem identification through field observation and discussion with village leaders.

A. Points production payoff—

A complete, integrated and balanced programme of soil, water, crop and livestock management is the aim.

1. Mechanical practices.
2. Agronomic practices
3. Minerals, nutrients to be maintained or restored.
4. Cultural practices to fit soil.
5. Cropping practices

B. Selection of problems.

1. Degree of difficulty
2. Order of solving.
3. Length of time-2,3,5,8,10 years.
4. Schedule.

C. For complete planning the following will be necessary.

1. Inventory of the farm and farmers resources.
2. Determination of land use.
3. Planning a water management system.

4. Development of management plans for land use
5. Selection of alternative crop and livestock enterprises.
6. Outline transition from present to future plans.

We shall deal with only those problems and factors which directly affect soil productivity.

II. Visit to Village — Map

A. Soils

1. Surface — Texture—depth slope-erosion
2. Drainage — surface-sub-surface water table wet spots-flooding.
3. Structure
4. Organic matter
5. Fertility

Observations—

Feel
Colour
rodents, crayfish, termites, ants, etc.

B. Crops — Practices

1. Grain — Drilled broadcast fertilizer
2. Fibre & oil — Compost Green manure
3. Foddor
4. Crop sequence.
5. Trees, orchards, etc.

Observations

Stand

Colour

Vigour

Weeds

Disease

Insects

Seed bed condition

Soil surface condition

C. *Water*

1. Source
2. Amount and time available
3. Quality

Observation

Method of application

Control

D. *Farmer*

1. Managerial ability
2. Likes and dislikes
3. Labour
4. Equipment
   (*a*) soil preparation
   (*b*) planting
   (*c*) cultural
   (*d*) plant protection
5. Sources of power

Observation

Condition of equipment

Condition of power

E. *Village Lands*

1. Roads
2. Drains
3. Canals
4. Fences
5. Livestock grazing areas
6. Trees

EVALUATION OF SOIL & WATER CONSERVATION NEEDS OF AN AREA

M. Harrison Taylor

I. Introduction :

The development of an area depends upon a complete study of the problems and the selection of practices which should be applied to the land. Consideration should be given to the order in which practices are to be applied.

Attention needs to be given to the following five fields: Soil and water losses, Drainage and Irrigation. Soil Structure, Organic Matter and Fertility. Until the least of these have been corrected one cannot expect to secure maximum production from normal agricultural crops.

II. Physical Factors of Climate, Soils, Water and Land Features:

A. Climate :

1. Length of growing season
2. Distribution, intensity and amount of rainfal
3. Maximum and minimum temperatures
4. Intensity of sunshine and degree of cloudiness
5. Direction and velocity of winds.

B. Soils: "Understand as a living organism"

1. Soil depth.

The depth to which roots of agricultural crops can penetrate easily.

2. Soil texture.

The per cent of sand, silt and clay and the relationship to water holding capacity, aeration, plant nutrient holding and exchange.

3. Permeability.

The degree to which water and air can move freely within the profile.

4. Structure.

The arrangement of the individual particles in relation to each other. Pore space is directly related to the arrangement of particles.

5. Organic Matter.

Organic substances in the soil, living or dead, fresh or decomposed are part of the soil organic matter.

C. *Water :*

1. Hygroscopic water—absorbed from the air and is tightly held. Not available to plants.

2. Capillary water—held against gravity but evaporates easily.

3. Gravitational water—drains readily by gravity if there are no restricting layers.

4. Sources—Rainfall, irrigation and dew or air moisture.

D. *Land Features :*

1. Slope—feet of rise or fall per one hundred feet, measured in per cent.

2. Erosion—movement of soil particles by minor natural forces such as wind, water and gravity. These may work alone or in combination.

3. Infiltration—rate of movement of water into the soil.

4. Vegetative Cover—amounts and kinds of cover on the land, from forests to fallow.

5. Surface storage—amount of area which holds water for relative long periods of time such as pond or lakes to steep areas where water leaves as rapidly as it falls.

III. Comments.

The evaluation covers many of the foregoing points and can only be made if the evaluator recognizes and understands these points in relation to production and soil and crop management.

The biological factors of insects, plant diseases, weeds and animals may have a direct bearing on the farming operation but because of time are not being considered. All operations are controlled by economic factors of the community and individuals, as well as likes or dislikes of individuals.

We will limit our evaluation of needs to the physical factors.

The following table indicates the extent to which we can influence or alter various soil and land conditions.

Factors	*We have to put up with*	*We can do something about*
Soil	Soil type (texture)	Organic matter content, aggregation, detachability, transportability, moisture content, productivity and protective ground cover.
Temperature	air temperature	Extreme variation of soil temperature.
Rain	Intensity and amount of rain	Intensity with which rain strikes the ground.

Factors	*We have to put up with*	*We can do something about.*
Runoff	Nothing	Amount, rate, velocity, frequency, place of runoff and adequate drains.
Wind	General wind direction	Wind velocity at ground level.
Slope	Average steepness of slopes, direction (aspect) of slope	Steepness of individual stretches of slope, length of slope.
Land use	Economic crops suited to a given climate and soil	Selection of adapted crops, methods of cultivation and management.

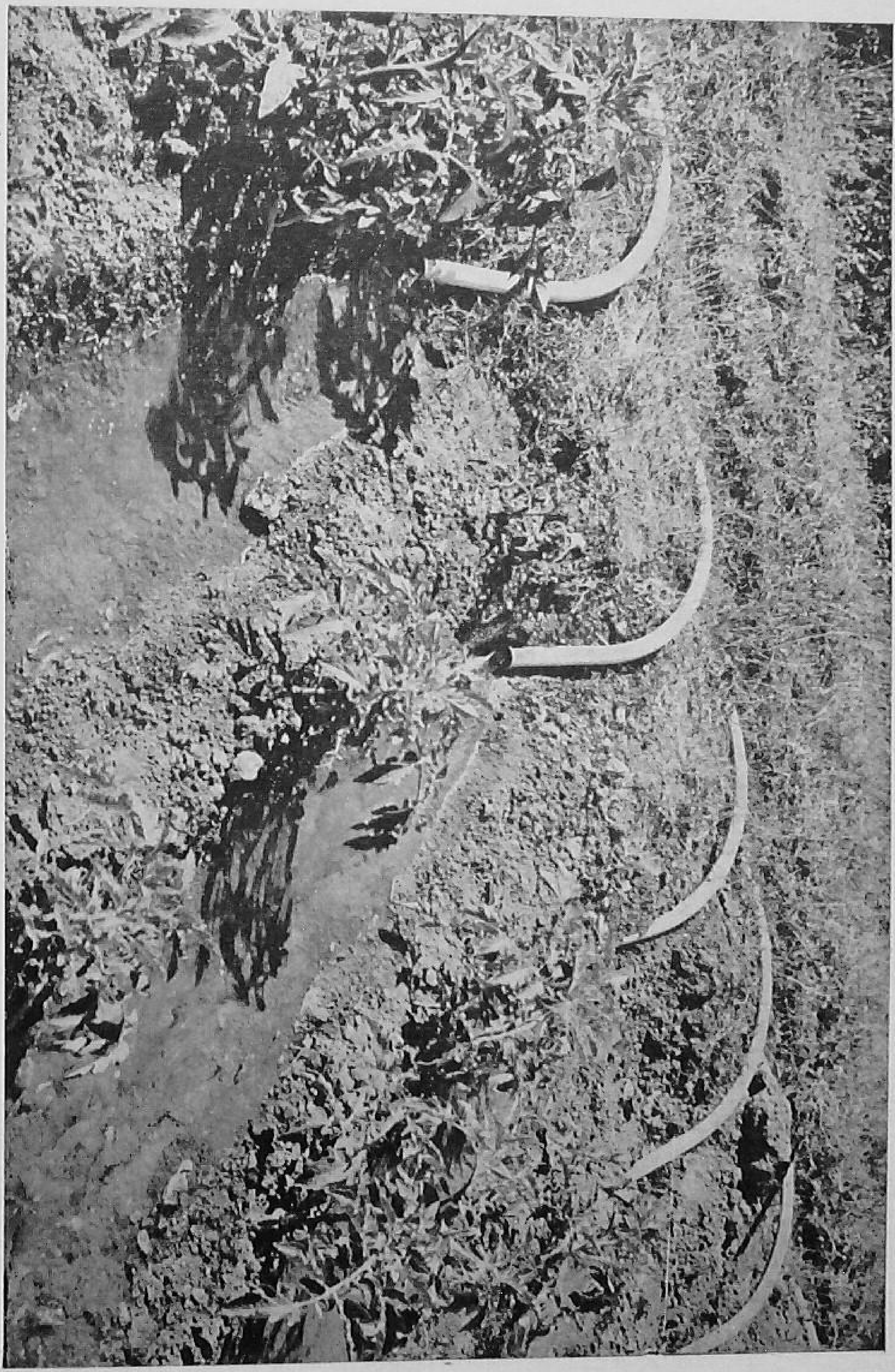
IV. A few Practices which might be used, based on needs:

A. Water Control—Vegetative

1. Proper land use—row crops *vs.* permanent cover
2. Change in crop or management
3. Permanent cover
4. Rotations
5. Strip cropping.
6. Crop residue management
7. Use of fertilizer
8. Cover or green manure crops
9. Trees and shrubs
10. Woodland protection
11. Controlled grazing
12. Gully control with vegetation.

B. Water Control—Mechanical

1. Contour farming.
2. Terraces and bunds
3. Diversion bunds
4. Waterways
5. Gully control
6. Flood control structures
7. Development of springs



Furrow Irrigation

8. Tanks or ponds
9. Treating soil pans
10. Tillage practices
11. Drainage ditches
12. Ridge planting
13. Weeding
14. Irrigation practices.

C. Wind Control.

1. Wind strip cropping
2. Strip cropping
3. Rough tillage
4. Ground cover
5. Cover or green manure crops
6. Semi permanent cover crop
7. Deep listing and listing.
8. Dune control
9. Wind breaks

GOOD SEED OF IMPROVED VARIETIES NEEDED EVERY YEAR

Improved varieties are made available through seed multiplication schemes.

1. Seed farms, seed marketing societies and seed dealers *can* assure that this seed is high in germination and free of trash and weed seed through proper grading and seed testing. Seed testing laboratories can help you.

BUT....

Cultivators may use own seed, except for hybrid maize 4-5 years.

1. Good germinating, pure seed of improved varieties is needed *every* year for full stands to secure maximum yields.
2. Cultivators can and should test their own seed for germination.

Important points about seed germination:

1. Dry seed (less than 12 % moisture) should have been stored in a cool, dry place.
2. Seed germination cannot be determined by looking at the seed—test 100 seeds selected *at random* for germination.
3. Seeds can be germinated in sand, soil, cotton absorbent paper, and cloth—use any method but test it.
4. Most seeds germinate best with temperature between 20° C and 30° C (68° F-86° F).
5. Seeds should be kept moist but not *wet* during germination.
6. Some seeds require longer than others to develop normal seedlings—be patient—7-14 days is needed for most seeds.
7. Let seedling develop a healthy plumule (leaf area) and root before counting it as a "good seedling".
8. If germination is low (below 75-80%), recommend getting new seed or adjusting seedling rate.

THE EFFICIENT USE OF FERTILIZERS

M. Harrison Taylor

A. Purpose

To develop an appreciation of the fact that increased and sustained crop production is not a one or two practice job such as adding a little nitrogen, or getting some improved seed, but rather the development or a complete soil and water management programme which includes adding the necessary plant nutrients for building soil fertility.

B. Objectives

1. To understand that crop response is best when fertilizers and water are available in proper amounts and at the right time.

2. To recognize that care must be taken to keep the soil in place and water available to develop land for increased and sustained yields.

3. To consider the need for understanding those practices which make for efficient use of fertilizer and water in relation to soil characteristics and conditions.

It is impossible to treat the five subjects:

(1) soil conservation, (2) rainfall, (3) irrigation (4) land levelling and (5) drainage adequately in one lesson. However a few guidelines have been established to stimulate thinking and possible courses of action.

1. Soil Conservation

Soil conservation aims to improve and maintain the surface and root zone of the soil for increased and sustained production by determining the problems of each soil and treating each soil according to its needs.

The efficient use of fertilizers and soil conservation go hand in hand.

There is little need for applying fertilizer and then allowing it to be carried away with the soil or water through erosion. Soil loss takes place when soil particles are moved from one place to another either by water, wind, man or gravity. In all but a few instances this movement of soil does not fit into a sound fertilizer programme. The plant nutrients in the soil and those contained in fertilizers tend to attach themselves to the smaller soil particles of clay and silt and the organic portion of the soil. These particles and organic matter are most easily carried or moved through soil erosion. The aim should be to keep the soil in place by preventing soil movement.

Soil has many of the features and characteristics of a living organism which include respiration, circulation, a skeleton, temperature, profile and skin. Soil needs to be managed in such a way that each of the above can function properly.

Moisture should be present in sufficient amount and at the proper time for the roots to secure soil nutrients for plant growth. It is just as necessary to remove the excess water since this occupies space that would be filled with air for normal respiration of roots. Some speciality crops such as rice can stand excess water. However, this water should be changed at intervals for proper aeration or respiration.

Each feature or characteristic can be determined and studied to work out the best solution for improving, maintaining or correcting a particular soil condition. For example temperature of soil might be controlled by use of organic matter as mulch, cover crops, stubble, etc.

Quite often you will find a feature or characteristic of a particular soil in such poor condition that the use of fertilizer would not be recommended until the condition is corrected. An example might be poor structure where air and water relationship in the soil prevents proper root development.

Before maximum production can be attained each of the following features of the soil should be studied; erosion, drainage, structure, organic matter and fertility. Corrective measures can then be applied. If the condition cannot be corrected it will be a limiting factor in production and the recommendations built around the factor or factors.

Kinds, forms and some suggested corrective measures follow:

EROSION

Kinds	*Forms*	*Some of the corrective measures*	
Surface	Splash	Ground Cover Mulch	
	Sheet	Contouring Strip cropping Crop Residue Management	Wind breaks Right angle planting
	Rill	Terraces or Bunds Contouring Rotations	
	Gully	Diversions Structures Permanent Cover	
	Dunes	Wind breaks Permanent Cover	

Kinds	*Forms*	*Some of the corrective measures*
		Irrigation
	Stream-bank	Watershed protection Structures Rank plantings Rip rap
Internal	Pans and inhibiting layers	Change plowing depth deep rooted crops in rotation, sub-soiling Controlled grazing proper irrigation
	Leaching	Control the amount of water passing through profile.

DRAINAGE

Surface	Standing water	Waterways Surface drains Open ditches deep rooted plants.
	Running water	Contouring Contour terraces or bunds Diversions Strip cropping permanent cover
	Droughty	Contouring Pitting Level terraces or bunds Organic matter Deep rooted plants Permanent cover
Internal	Excess water	Mechanical drains (rock) (mole) (tile) Deep rooted crops

Kinds	*Forms*	*Some of the corrective measures*
		subsoiling
	Water-logging	Open ditches Pumps
	Droughty	Controlled irrigation Interception drains Organic matter Deep rooted crops Permanent cover

STRUCTURE

Types	Single grain	Organic matter minimum tillage
	Flatty	Organic matter minimum tillage deep rooted crops cover crops.
	Blocky	Organic matter deep rooted crops cover crops rotation.

Organic Matter

Very difficult to maintain under tropical conditions

Causes of Loss

1. Parasites—white ants, sheep, goats and cattle.
2. High temperature of soil.
3. Ploughings and cultivation.
4. Erosion—wind and water.
5. Fuel and burning.

Benefits and Uses

1. Conserve moisture (held water to 130% of weight)
2. Control soil temperature.

3. Prevent splash and sheet erosion.
4. Improves structure and soil tilth.
5. Involved in 95% of nitrogen in soil.
6. Holding and exchange of plant nutrients.
7. Improves water infilteration rate on medium and heavy soils.
8. Helps control weeds when used as mulch.
9. Helps to release plant nutrients in mineral soils.
10. Provides food for soil micro-organisms.

Fertility

Natural	Parent materials— exhausted by cropping ,, ,, leaching ,, ,, erosion May contain excess and harmful salts not available because of PH value.
Development	Released plant nutrients major needs—N.P.K. Use of soil tests for application guide. Build reserve.

2. Rainfed.

Under rainfed conditions of farming fertilizers become very important. It is both an art and a science to get maximum benefits from fertilizer. Methods of water conservation have little meaning if plant nutrients are not present for the crop to use the water efficiently. It is an art in having the fertilizer placed in the right position for use by the plant and a science in knowing the correct amount needed in the particular soil for various levels of crop production.

Under undisturbed natural conditions the elements taken up by the plants are reduced to the soil when the plants die and decompose. But in farming a large portion

of the plant is removed year after year and eventually the soil nutrients become depleted and plant growth is affected.

Fertilizers are used to correct plant nutrient deficiencies and under rainfed conditions the kind, amount, time, frequency and method of application becomes important if good responses are to be secured.

Unsatisfactory yields do not necessarily mean that a nutrient or nutrients are deficient. Drought, excessive wetness, poor physical condition of the soil, diseases are other reasons that the yield was low. As we have seen before, soil tests are designed to recognise plant nutrient deficiencies early and give an opportunity to correct them before the crop is affected.

You can find evidence and research data which supports the use of fertilizers under rainfed conditions. A point to keep in mind is that with proper land management and fertilisation many soils can be improved to a fertility and production level, higher than they were in their original condition.

3. Irrigated

The use of fertilizer under irrigated conditions give opportunities for maximum production and economic returns. However, fertilizer and water must be applied in proper amounts and time, based on the soil and plant needs.

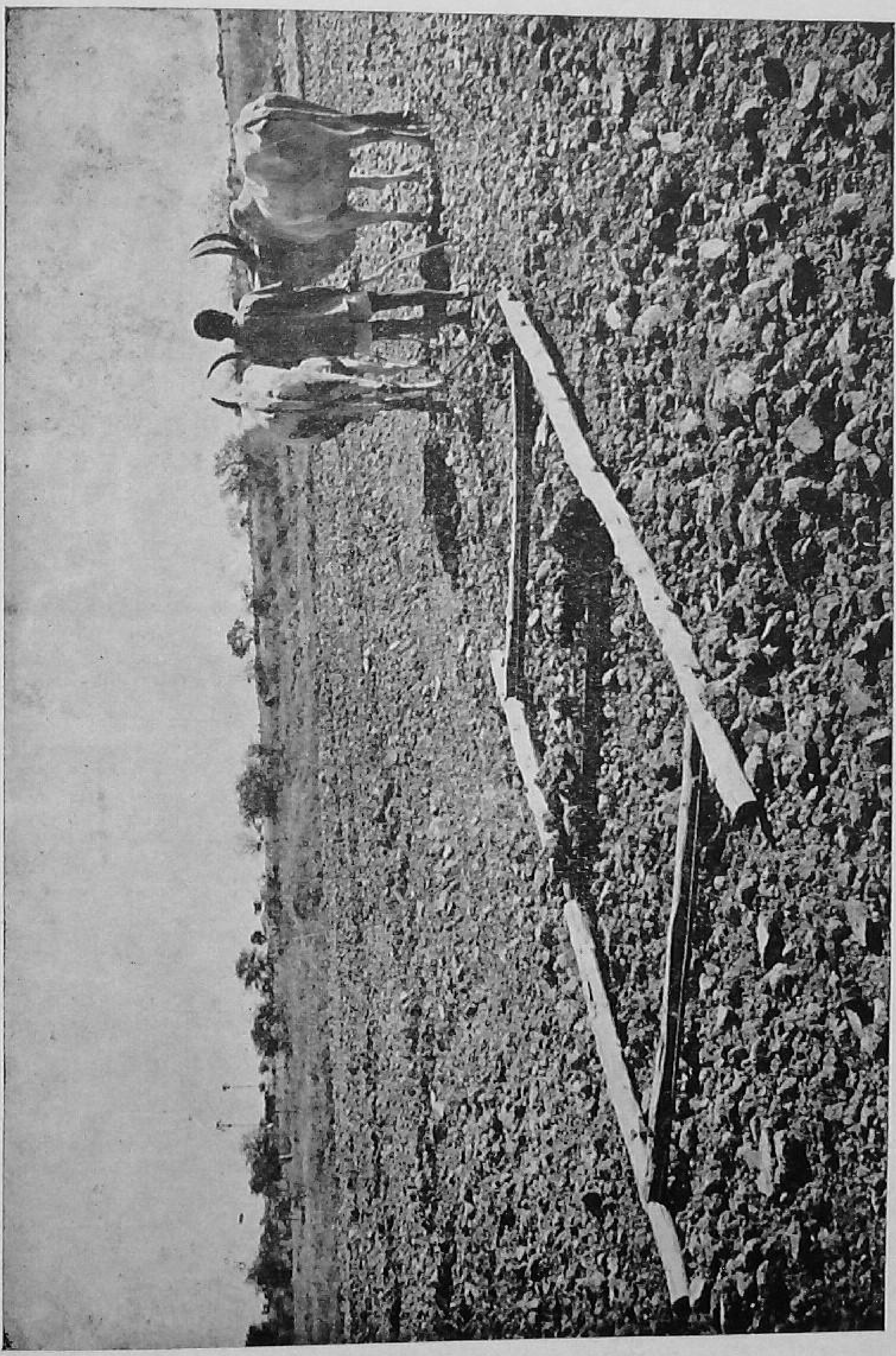
A wider selection of crops and crop sequences are available under irrigated conditions. The cultivators' fertilizer programme should be built around the crop sequence to improve and maintain his soil fertility. One should make a critical examination of the surface soil, subsoil, land slope, depressions and drainage conditions

as related to the cultivators ability and resources to assist in selecting the best combination for existing conditions. Only with the establishment of the best combination can one expect maximum benefits from fertilizers.

The method used in irrigating is quite important to get good returns from fertiliser. The four principal types of irrigation are : (1) surface ; (2) furrow ; (3) sprinkler and (4) sub-irrigation. There are many variations of these methods. The methods used should be determined from the following factors ;

1. Quality of water
2. Amount and method of water delivery
3. Water costs
4. Soil texture, slope and topography
5. Cost of land preparation
6. Value of land and its productive potential
7. Crops to be grown
8. Prevailing practices in the district.

Successful irrigation requires good water management This applies to water application, leaching and drainage. The beating of the rain drops, trampling by livestock working soil under poor moisture conditions, application of muddy water or soil moved by irrigation water may reduce the infiltration rate or intake to one-tenth the normal rate of the soil. Example ; If the normal infiltration rate for a given soil is 0.50 (1 inch) of water per hour under the above conditions the infiltration rate, would be reduced to 0.05 inches per hour. Likewise, the above soil under normal conditions would take up 2 inches of water in 4 hours but it would take 40 hours to absorb 2 inches where the infiltration rate has been reduced to one-tenth of normal. This is very common under rainfed conditions as well as with irrigation. Good



Land Lavelling

economic return from fertilizers cannot be expected where infiltration is poor.

The quality of irrigation water will have and effect on the plant repsonse to fertilizers. Good irrigation water should not have harmful amounts of any salt or toxic substances. Experience and experimentation have shown that successful long-time use of any irrigation water will depend more on such factors as drainage, leaching, rainfall, salt tolerance of crops, irrigation and soil management practices, than upon water quality itself.

Many rainfed and irrigated soils under 30 or more inches of rainfall have become badly leached and the plant nutrients carried beyond the reach of regular agricultural crops. These soils are in need of large quantities of fertilizer to restore their productive capacity.

4. Land Levelling

Land levelling or grading are terms used to describe the movement of soil in preparing land for irrigation or drainage. Once land has been levelled, yearly operations are usually necessary. This is referred to as planning, smoothing or floating.

When the land surface is uneven the use of irrigation water becomes inefficient as noted in wild flooding. Drainage is poor and the stands and growth of the plants are not uniform. Efficient use of fertilizers should not be expected under these conditions.

Land is usually levelled with a slight slope of grade to permit water to move over the land for irrigation, drainage and rainfall run off. It is often necessary to use mechanical practices other than drainage channels in combination with land levelling such as contour bunds,

diversion channels, drop structures or even develop bench terraces.

The type of farming and the methods used will generally determine the need for land levelling. Soil characteristics such as depth, texture, structure, parent materials and sub-soil need to be taken into consideration before recommending land levelling. On shallow soils where large areas of sub-soil or parent materials will be exposed, other methods of preparation and management should be used such as contour furrow irrigation, strip cropping, permanent cover, etc.

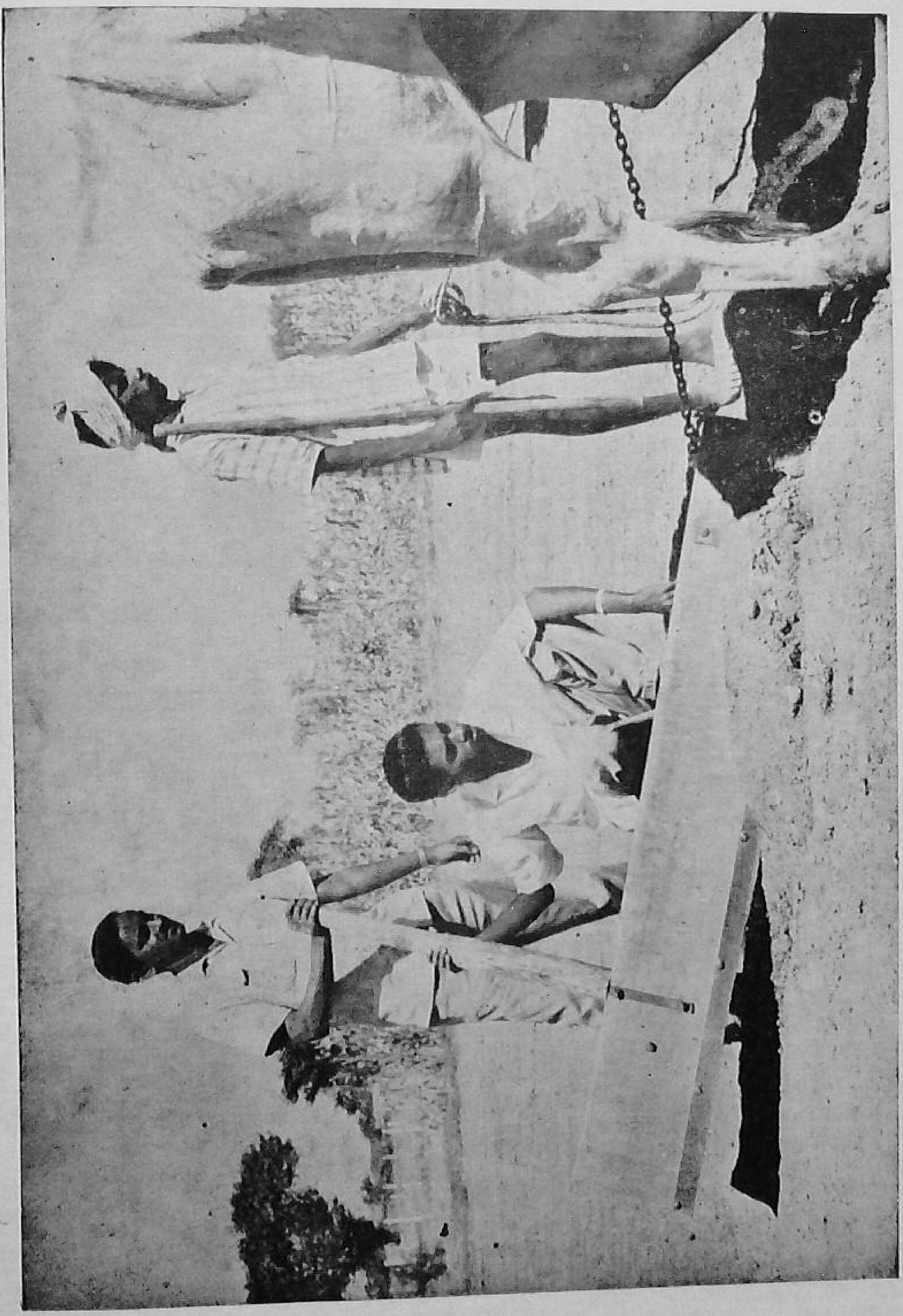
5. Drainage

Water is probably the most important soil ingredient for plant growth. It should be in just the right proportion in a soil for good production. Too much water effects plants just as badly as too little water. By drainage water can be controlled to make moisture conditions good for plant growth. Drainage of agriculture land has been given very little attention although cultivators are aware of the need of drainage in many instances.

If there is too much water in the root some (usually 2 to 5 feet of soil for major agriculture crops), it is doubtful whether fertilizer should be added until the drainage is improved.

The water holding capacity of sandy or light soil is about $1\frac{1}{2}$ to $1\frac{1}{2}''$ per foot of soil, medium texture 1* to $2\frac{1}{2}''$ and heavy texture $1\frac{1}{2}''$ to $2\frac{3}{4}''$. If this amount of water is maintained, normal plant growth will take place.

Soil drainage is probably the Number One problem of India today. It is closely related to soil texture as indicated below ; (Texture is not uniform throughout the profile.



Planker

Texture class	*Water holding capacity*	*Infiltration*	*Potential fertility*	*Permeability*	*Tilth & workability*
Light					
(Sand & loamy sand)	Poor	Good	Poor	Good	Poor to fair
Medium					
(Loam to silt)	Fair to Good	Good to Fair	Fair	Good	Good
Heavy					
(Sandy clay loam to clay)	Poor	Good to Fair	Good	Fair to Poor	Fair to Poor

Farm drainage has been neglected in many areas. The drainage has been restricted to the large drainage ditches. Even with the construction of the drains the cultivator must be able to move the excess water into the drains. This involves channels to carry water away just as channels are necessary to deliver irrigation water.

Waterlogging is to drainage the same as a gully is to erosion. Both are signs of the late stages in soil deterioration. Both need very careful attention and work to correct. However, the rewards are great. If done properly there can be a lasting effect.

SOIL AND LAND MANAGEMENT

M. HARRISON TAYLOR

Introductory

Soils as we see today are the outcome of various weathering agencies working on different types of rocks through millions of years.

According to the generally accepted theory, orignally it was all a huge mass of very hot gases which gradually cooled down to a hot fluid and then a crust type of thing was formed on the top of this hot fluid which came to be known as earth's surface. Things cooled down gradually due to the action of water and air till such time that conditions became favourable for life. To have a rough idea of the existence of life on earth's surface, imagine a pilar 750 feet high compared with a line of the thickness of an ordinary pencil drawn line Man's existence on the earth is still less, say, 1/10th of the thickness of an ordinary line.

Weathering Agencies :

Factors which are responsible for soil formation through their action on various rocks are known as weathering agencies. They are water, wind glaciers, temperature, pressure, gravity, plants and bacteria etc. These various weathering agencies have different modes of action but variable intensity *i.e.* transporation and graded sedimentation of the soil material and the resulting soils are called alluvial and loess or aeolian soils respectively.

Action of temperature and pressure is expansion, contraction and eventual breaking up of rocks thus giving rise to residual soils which are formed *in situ*.

Glaciers and gravity also transport and sediment the soil material giving rise to till and colluvial soils. Plants grow and their roots penetrate into the soil, their action is more of physical nature and to some extent chemical. Bacteria have more or less a chemical and biological type of action as a weathering agency. Different rocks which go to form soil due to action of weathering agencies are called parent material, Chemical weathering is brought about by mainly simple solution, oxidation and hydration etc.

Definition of Soil :

A simple definition is that soil is the mineral plus organic portion of the earth's surface capable of supporting plant life. Soil composition is so variable that it will not be an exaggeration to say that soil varies from inch to inch. However an average ideal soil has the following composition by volume ;

Mineral Matter	48%
Organic matter	2%
Air	20%
Water	30%
	100%

Soil Profile

A vertical section of the soil is called a profile. When we look at a profile it looks like different layers of material placed on one another. These layers are called horizons of which upper 9″-12″ is called top soil and below sub soil down below upto parent material. The horizons are also termed A, B and C.

SOIL PROFILE DESCRIPTION

Area ....Collector.............................

Plot No. or Location ....Date ....

Crop ....Weather & Condition.........   .....

Depth | *Illustrate* | *Notes*

	Surface		Subsoil
	....	Colour	....
	....	Texture	....
	....	Structure	....
	....	Drainage	....
	....	Effecive Depth	....

Other physical conditions, *e.g.* soil pans, salinity, water logging, stoniness, kankar (depth, cementation, thickness).

Legend—*Colour*—Gray, Black, Yellow, Br

Texture	*Structure*	*Drainage*	*Effective Depth*
1 Very Heavy	Granular	1 Very Poorly	1 Very Deep —60″ & over
2 Heavy	Blocky	2 Poorly	2 Deep —36″—60″
3 Medium	Platy	3 Moderate	3 Moderate —20″—36″
4 Light	Massive	4 Well	4 Shallow —10″—20″
5 Very light	Single Grain	5 Excessively	5 Very shallow—0—10″

Identification of Soil horizons :

Physical characteristics of different horizons are tabulated below on a comparative basis:

	Topsoil	*Subsoil*	*Parent Material*
Colour	Dark	Lighter	Lighter
Texture	Lighter than B in 90% soils	Heavy	Variable, often higher than B
Structure	Small aggregates	Larger	Variable (often larger) not always definite

Physical characteristics of soils :

Some of the physical characteristics of transported soils are as under:

S. No.	*Name of the soil*	*Agent*	*Characteristics of the soil materials*	*Profile Develop-ment*	*Position*
1.	Alluvial	Water	Stratified, water worn rounded rocks and gravel (Bet are a typical alluvial,	No	Bottom (Bet)
2.	Terrace (Dhaya)	Water	Same as for 1.	Yes	Terrace (Dhaya)
3.	Loess or aeolian	Wind	Smooth silty matter	Yes	Upland
4.	Glacial	Ice	Graded, highly sharp material	Yes	—do—
5.	Colluvial	Gravity	Sharp and angular material	Yes	Talus
6.	Lacustrine	Water	—do—(formed at the base of a lake).	Yes	Terrace

Soil Texture :

Soil texture indicates the percentage of clay, silt and sand present in the soil. The particle size of these three constituents varies considerably and so does their percentage in a soil type also called textural class.

Sizes of different soil particles are as under :

Soil Particle	*Size in Millimeters*
Fine Gravel	1-2
Coarse sand	1-0.5
Medium sand	0.5-0.25
Fine sand	0.25—0.10
Very fine sand	0.10-0.05
Silt	0.05-0.005
Clay	Below 0.005

If a soil suspension in water is allowed to settle, sand of all sizes will settle down in 2 minutes, silt particles in 2 hours while clay will settle down in 48 hours. Soil Scientists have classified soil into 12 textural classes but in general we can classify soils in three main textural groups *i.e.*, light, medium, and heavy soils. With the help of percentages of sand, silt and clay found by simple sedimentation.

Various textural groups falling under heads light, medium and heavy are:

S.No.	*Suggested textural term*	*Alternate terms*	*Suggested textural class to be included*
1.	Very heavy	V. fine textural heavy clays	Heavy clay, 60% or more 2, micron clay.
2.	Heavy	Fine textural clays to moderately fine textural clay loams	Clay, silty clay, sandy clay silty clay loam, sandy clay loam
3.	Medium	Loams to fine sandy loams	Silt loam, loam, v. fine and fine sandy loam, sandy loam.
4.	Light	Coarse loamy sands	Loamy fine sand, loamy sand
5.	Very light	V. coarse sands	Sand, course sand

Physical properties like water holding capacity, tilth and workability etc. of these textural classes are tabulated

below:

Textural term	*Textural class*	*Tilth and workability*	*Infiltration*	*Water holding capacity*	*Potential fertility*	*Permeability*
VH	Clay 2-Micron	Poor	Poor	Good	Good	Poor
H	Silty clay	P	P	G	G	P
H	Sandy clay	P	P	G	G	P
H	Silty clay loam	Fair	P	G	G	F
H	Clay loam ?	F	F	G	G	F
H	Sandy clay loam	F	F	G	G	F
M	Silt	G	F	G	G	G
M	Silt loam	G	F	G	F	G
M	Loam	G	G	F	F	G
M	Sandy loam	G	G	P	P	G
M	Loamy Sand	F	G	P	P	G
VL	Sand	P	G	P	P	G

1. Tilth and workability relate to texture and organic content.

2. Infiltration is the rate with which water penetrates the soil.

3. Water holding capacity of a soil means the amount of water that 1 foot column of soil will hold and which is available to the plants.

4. Potential-fertility is basically dependent upon heaviness or lightness of the soil.

5. Permeability is the rate of flow of water inside the soil.

Soil texture is also influenced by the presence of organic matter which improves it considerably.

Other physical properties of soil are soil structure and soil colour.

Soil Structure :

It is the arrangement of soil particles. It may be :

1. *Platy :* Soil with such a structure will have poor permeability and hence poor drainage.

2. *Blocky :* Such a structure may account for excessive drainage.

3. *Prismatic or Columnar :* Such a structure will have easy permeability and thus good drainage.

4. *Nut like :* This will have excessive drainage.

5. *Single grain structure :* Such a structure will have excessive drainage.

6. *Crumb or Granular :* Such a structure is ideal—proper drainage and permeability.

7. *Massive :* Will not allow good tilth, poor drainage and low permeability.

Soil Colour

Soil colour indicates the extent of drainage and to some extent organic matter content of a soil. A defective drainage will produce a combination of different colours like grey, brown and yellow. It is also called mottling while a good drainage will produce a uniform reddish brown colour. A key to soil colour and drainage is as under :

S. No.	*Type of drainage*	*Soil Colour*	
1.	Very poorly drained	Grey colour on the surface	
2.	Poorly drained	Grey and yellow colour at a depth of 0-6″.	
3.	Moderately well drained	—do—	6-18″

4.	Well drained	No mottling, uniform reddish brown colour.
5.	Excessively drained	Bright reddish colour.
6.	Droughty.	Pure sand or gravel, water goes too fast.

Parent Material may cause colour differences.

Land Features :

Effective depth, slope, drainage, erosion and surface texture are main land features.

Effective Depth :

This is the depth of soil layer upto which plant roots can go without being obstructed. This depth may be limited by a hard pan, concretion, salt concretion or water.

Slope :

It is expressed as percentage *i.e.*, so many feet per 100 feet of land *e.g.*, 4% slope means that from a certain point land is depressed or raised by 4 feet per 100 feet.

Drainage :

It is considered both in upper surface and lower surface.

Five aspects of Land Management : 1. Erosion. 2. Drainage. 3. Fertility. 4. Structure. 5. Organic matter.

1. *Erosion :* Where there is a profile, erosion may be defined as the movement of soil particles from one place to the other. Agencies bringing about erosion are water, wind, man and gravity. According to severity or erosion, it is classified into :

(*i*) Splash erosion--caused by striking of rain drops on the soil surface. It is so important a type

that it is estimated that 4″ rain falling in 24 hours has the power to lift 9″ top soil of an acre, 36″ high eighty times.

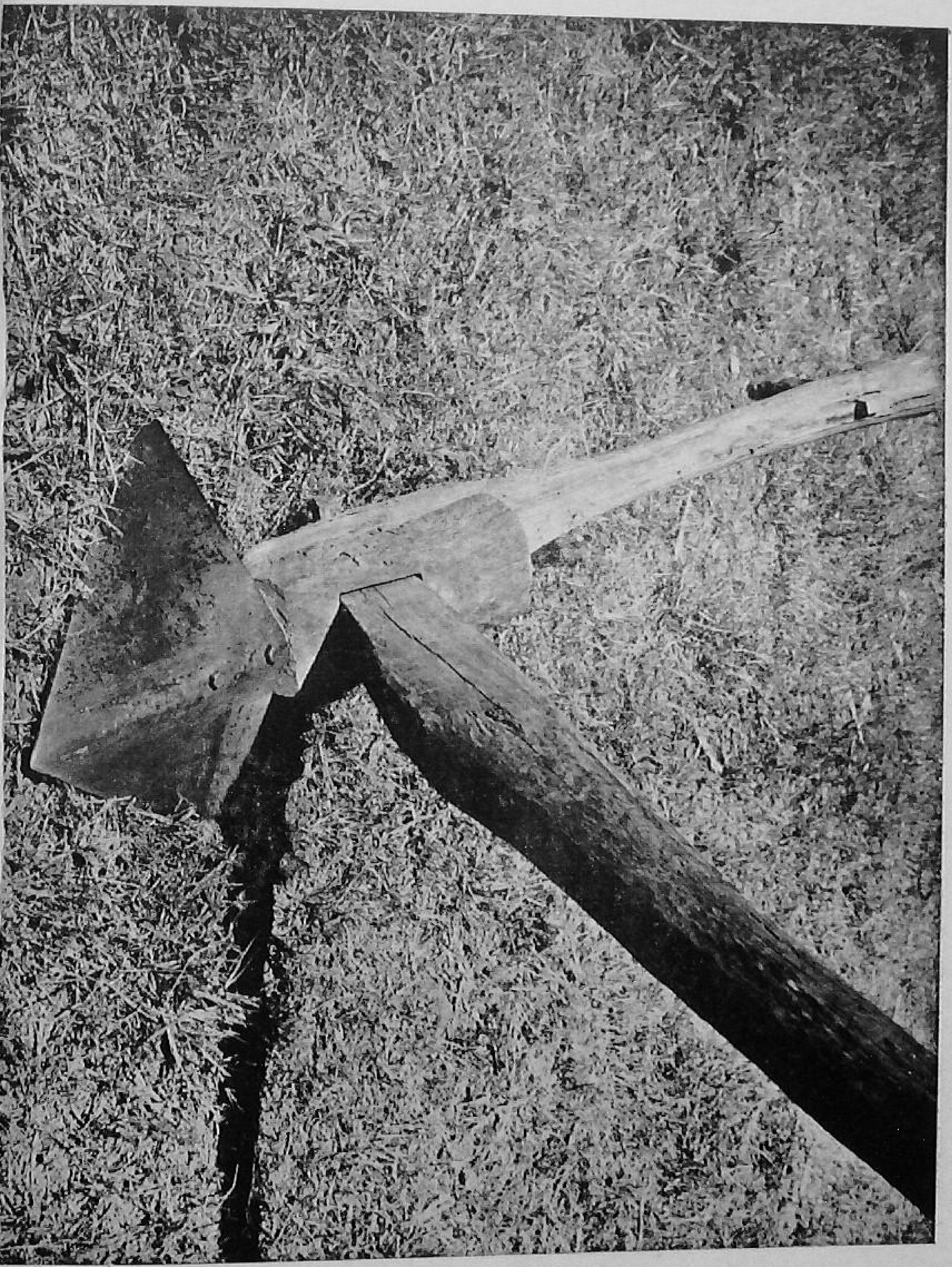
(*ii*) Sheet erosion—removal of soil particles in sheets (often not identified). (In many cases 50% top soil may be removed).

(*iii*) Rill erosion: After 50% erosion, there may appear small finger like channels called rills And the erosion is called rill erosion.

(*iv*) Serious form of rill erosion is called the Gully erosion. There is another type of erosion called the internal erosion caused by the leaching action of water.

Erosion can be checked considerably by contouring terracing, mulching, cover cropping, addition of organic matter and grass water ways etc.

2. *Drainage*: It implies disposal of excess water both from upper surface and lower surface of the soil. I has a great bearing on the colour of the soil, the fertilizer use and the very basis of crop production. Drainage can be improved by addition of organic matter in heavy soils, digging of open ditches, ponds and tanks, tile drainage and bedding etc. A great degree of success in any farm planning depends upon efficient drainage. Requisites of a good drainage system are to establish good air and water relationship.



Ditcher

EFFECTS OF FLOODING OF CERTAIN FORAGE CROPS

	Number of days Flooded without permanent Injury
Bluegrass, Ky.	25-35
Bromegrass, Smooth	24-28*
Clover, Ladino	10-20
Clover, Red	7-10
Clover, Sweet (Biennial)	9-12*
Corn	24-36 hours
Field Brome	20-30
Lespedeza, Korean	5-8 (if not over 4* deep)
Lespedeza, Sericea	30-40 (in winter, 10 in summer)
Orchard Grass	15-25
Red top	15-35
Red Canarygrass	49
Rye	3-6 (except in winter)
Ryegrass	15-20 (in winter)
Sorghum, Grain	14-28 (Plants over 12 high) 2*.
Soybeans-Pulses	5-8 (if water is moving)
Tall Fescue	24-35*
Tall Oatgrass	15-20
Timothy	49*
Wheat, oats, barley	3-6
Wheatgrass, crested	10-17*
Wheatgrass, slender	31-35*

*Soil Conservation Handbook

3. *Fertility:* Fertility of a soil is defined as the relationship between the elements present in the soil, their

availability and the needs of the plants. It is influenced by many factors like soil texture, presence of organic matter, salt content of the soil, percentage of available nutrients and types of agronomic practices practised on a particular land.

(*i*) *Soil Texture :* As we have already defined the soil texture is the percentage of sand, silt and clay present in a soil. Usually soils having a higher percentage of clay and silt are more fertile. But however we can't bring about any significant change in the texture of a soil.

(*ii*) *Salt content of the soils :* A soil having high salt content will not be as productive as a soil with normal salt content. Most field crops give best results on lands having normal ph *i.e.* near about 7.0.

(*iii*) *Percentages of available nutrients :* This is the basic factor affecting the fertility of soil. Fertility status of a soil can be judged from the following table :

Fertility status	*Available N*	*Available P*	*Available K*
High	500 lbs. and above	20 lbs. and above	200 lbs. and above
Medium	250-500 lbs.	10-20 lbs.	100-200 lbs.
Low	Upto 250 lbs.	10 lbs. and below.	100 lbs. and below.

(*iv*) *Organic matter :* Organic matter is defined as any matter that ever contained life. The active constituent of organic matter is the humus which is a dark reddish brown jelly like substance and product of all bacterial activity. It is the main

substance which fixes up nitrogen for use by the plants. Presence of organic matter improves soil texture, structure, tilth and workability, fertility, drainage and permeability. In this connection one important point is to be noted and that is the carbon-nitrogen ratio of various sources of organic matter.

Name of the substance	*C.N. Ratio*
Humus	10-12:1
F.Y.M.	20-25:1
Lucern	23:1
Vetch (Guara)	28-30:1
Green rye	36:1
Dry maize stalks	60:1
Wheat green	36:1
Wheat straw	80:1
Dry grass	80:1
Saw Dust	400:1

It may be noted that when any of the materials is either composted or green manured, the excess of carbon above 10-12 parts is simply wasted by way of oxidation and due to lack of nitrogen to combine with. Therefore it is desirable to add equivalent amount of nitrogen to the material to increase its utility. To cite an example 2 tons of straw with 80 lbs. nitrogen will be equal in organic matter content to 7 tons of compost.

While assessing total soil depletion, in addition to the figures mentioned above, the figures of erosion should also be included.

In addition to the above enumerated practices the general agronomic practices are use of good seed; fertilizer; irrigation; improved implements; insecticides; level-

ling, cover crops; organic matter; crop rotation; strip cropping; mulch; green manure; minimum tillage; inoculation; seed testing; growing of deep rooted crops and legumes; sub soiling.

(*i*) *Good seed and seed testing:* It should be ensured that only pure quality, plump, disease free, weed free and germination tested seed goes to the soil. This accounts for 10-15% increase in production.

(*ii*) *Fertilizer:* While recommending a fertilizer dose for a crop; soil texture, availability of nutrients (already mentioned), leaching and the most. important is the nutrient removal of that crop Some of the nutrient removal ratios of different crops are as under:

	Crop	*Basis*		*Nitrogen*	*Phosphorous*	*Potash*
1.	Wheat	Grain	1 md.	1.4 lbs.	0.8 lbs.	0.4 lbs.
		Straw	175 lbs.	0.8 ,,	0.3 ,,	2.2 ,,
		Total		2.2 ,,	1.1 ,,	2.6 ,,
2.	Barley	Grain	1 md.	1.5 ,,	0.6 ,,	0.4 ,,
		Straw	140 lbs.	1.0 ,,	0.4 ,,	2.0 ,,
		Total		2.5 ,,	1.0 ,,	2.4 ,,
3.	Lucern	Dry weight	2000 lbs.	50.0 ,,	11.0 ,,	32.0 ,,
4.	Maize	Grain	1 md.	1.4 ,,	0.8 ,,	0.5 ,,
		Straw	165 lbs.	1.8 ,,	0.6 ,,	2.7 ,,
		Total		3.2 ,,	1.4 ,,	3.2 ,,
5.	Cotton	Cotton	1 md.	2.7 ,,	1.0 ,,	1.0 ,,
		sticks	200 lbs.	2.3 ,,	0.7 ,,	2.5 ,,
		Total		5.0 ,,	1.7 ,,	3.5 ,,
6.	Paddy	Paddy	1 md.	1.0 ,,	0.6 ,,	0.3 ,,
		Straw	163 lbs.	1.0 ,,	0.3 ,,	3.0 ,,
		Total		2.0 ,,	0.9 ,,	3.3 ,,
7.	Groundnut	Nuts	1 md.	2.5 ,,	0.4 ,,	0.4 ,,
		Straw	250 lbs.	1.1 ,,	0.2 ,,	1.7 ,,
		Total		3.6 ,,	0.6 ,,	2.1 ,,

Crop	Basis		Nitrogen	Phosphorous	Potash
8. Bajra	Grain	1 md.	1.2 ,,	0.5 ,,	0.8 ,,
	Straw	250 lbs.	1.1 ,,	0.3 ,,	6.6 ,,
	Total		2.3 ,,	0.8 ,,	7.4 ,,
9. Jowar	Grain	1 md	1.1 ,,	0.7 ,,	0.6 ,,
	Straw	250lbs.	1.0 ,,	0.6 ,,	5.3 ,,
	Total		2.1 ,,	1.3 ,,	5.9 ,,
10. Soyabean	Grain	1 md.	6.0 ,,	2.0 ,,	2.2 ,,
	Straw	170 lbs.	1.0 ,,	0.5 ,,	1.3 ,,
	Total		7.0 ,,	2.5 ,,	3.5 ,,
11. Sugarcane	Harvest wgt.	2000 ,,	2.6 ,,	1.6 ,,	7.9 ,,

Soil texture and leaching are interlinked. Heavier the soil and more the organic matter content higher the retention percentage of fertilizers.

(*iii*) *Irrigation*: Irrigation should be applied to the crops according to their need and the moisture content and water holding capacity of a soil also count much in determining the total water requirements and frequency of irrigation to different crops. Other factors are leaching and evaporation losses and availability of water to plants and proper air and water relationship.

(*a*) Daily water requirements of some important crops in acre-inches are as under:

Name of the crop	*Daily water requirements in acre 1 inches*	
	Cold Weather 75° F	*Hot Weather 95° F*
Grass, Pasture & Forage	0.16″	0.20″; 0.25″

Name of the crop	*Daily water requirements in acre 1 inches*	
Potatoes	0.12″	0.14″
Beans, Gram etc.	0.15″	0.20″
Small grain cereals	0.20″	0.22″
Maize, cotton, sugarcane	0.15″	0.20″
Lucern	0.20″	0.25″

(*b*) Water holding capacity of different soils is as under:

Type of soil	*Water holding capacity of the soil in inches for 1 foot depth.*
Light texture	1½″—1½″ (Sandy loam will hold 1½″)
Medium texture	1½″—2″
Heavy texture	1 3/4″—2½″

(*c*) *Uptake of water by plant roots*

Roots of different plants grow to different depths and the percentage of water utilized by them also varies with the depth.

Name of crop	*Depth of root zone*
1. Grass, Pasture, Forage	1½′—3′
2. Potatoes	2′ —4′
3. Beans, gram etc.	2½′—4′
4. Small grain cereals	3′ —5′
5. Maize, cotton	4′ —5′
6. Sugarcane	6′
7. Lucern	4′ —8′.

(*d*) Percentage of water available to the plants in different soils and percentage uptake of water at different depths:

Type of soil	*Percentage of water available to the plants out of the total water holding capacity.*
Light	Upto 100%
Medium	80%
Heavy	60%

Depth of the soil	*Percentage water of the total requirement available to the plants*
25%	40%
50%	30%
75%	20%
100%	10%

It is evident from the table that as water goes deeper it is less and less available to the plants.

(*e*) Moisture content of the soil available to the plants can roughly be judged from following table :

Available Moisture	*Light Texture*	*Condition of the soil* *Medium Texture*	*Heavy Texture*
0-25%	Dry, loose, flows through fingers	Powdry dry, sometimes slightly crusted but easily broken	Hard baked cracked and sometimes has loose crumb on the surface.
25-50%	Appears dry, will not form Ball	Somewhat crumbly but holds together from pressure	Somewhat liable. Will ball under pressure.
50-75%	Tends to form ball under pressure but seldom stands to-together	Forms ball somewhat plastic, will sometimes stick slightly with pressure.	Forms ball, will ribbon out between thumb and forefinger.
75-100%	Forms weak ball, breaks, easily, will not stick	Forms ball which is pliable, sticks readily if relatively high in clay	Easily ribbons out between fingers and has stick feeling.
100%	No free water	No free water	No free water.

(*f*) Evaporation and leaching losses account for about 40% of the total irrigation applied *i.e.* if we want to make available to the plants 3″ of water, we will have to apply 5″ deep irrigation.

(*g*) Formula for frequency of irrigation.

Total inches of water held by 4 feet deep soil—Interval of days after Daily requirements of the crop which water should be applied.

But this interval shows complete exhaustion, therefore irrigation will have to be applied 1-2 days earlier than this interval.

(*h*) Total water requirements of a crop $= \frac{\text{Duration of the crop}}{\text{Frequency of irrigation.}}$ plus 40% evaporation and leaching losses.

(*iv*) *Improved implements, Minimum tillage and sub-soiling :* The implements used for preparing a seed bed should ensure that with their minimum use maximum degree of firmness in the seed bed is achieved *i.e.*, there are no clods and structure of the soil is only slightly destroyed. Keeping in view the depth of root zone of the crops, we should not confine ourselves upto upper 9″—12″ top soil, but subsoiling should also be done to break any hard pan and improve drainage and to ensure proper air and water relationship. Similarly levelling is also essential for a good seed bed.

(*v*) Growing deep rooted crops and legumes; addition of organic matter, crop rotations, strip cropping and green manuring are also important from soil conservation and crop production point of view. Growing of deep rooted crops leaves organic matter in the deeper layers

of soil by way of roots. Green manuring and growing of legumes helps build nitrogen and organic matter content of the soil. In this connection it will be worthwhile to see the comparative effectiveness of various green manure and legume crops by way of addition of nitrogen to the soil when they are ploughed into the soil.

Names of the green manure crop	*lbs. of nitrogen added to the soil per acre*
Sanhemp	75—100 lbs.
Dhaincha	68.9 lbs.
Guara	55.7 lbs.
Senji (whole)	120.1 lbs.
Urad	38.3 lbs.
Moong.	34.5 lbs.
Cowpeas	50.3 lbs.
Masur (Lentil)	59.4 lbs.
Berseem	54.2 lbs.
Metha	32.2 lbs.
Sanji (cut)	60.0 lbs.

In view of the carbon; nitrogen ratio of different materials, it is advisable to add more nitrogen to the green manure crops to increase their utility. In many cases the green manure crops may not give the expected response due to this very reason.

Crop rotation and strip crop help build soil fertility, check erosion and weeds. Addition of organic matter increases the fertility of soil and improves soil texture, drainage and water holding capacity etc.

Inoculation of legume crops stimulates growth and nitrogen fixation which ultimately leads to soil conser-

vation and high fertility. Cover crop or mulch are two alternatives in contrast to keeping the field fallow. Cover crop checks erosion and also builds up soil fertility. Similarly mulch checks erosion, helps conserve moisture.

4. *Structure*: As already defined is the arrangement of soil particles. It affects drainage, permeability, tilth and workability and ultimately plant growth. Best type of structure is the granular structure. Structure of a soil can be improved by addition of organic matter and subsoiling etc.

5. *Organic Matter:* As already discussed organic matter determines the fertility of a soil to great extent. It also improves drainage, tilth and workability, water holding capacity etc. It is estimated that 95% of the nitrogen is held by humus—the active content of the organic matter. Organic matter content is very easily lost in light textured soils. It can be added to soil by green manuring, addition of F.Y.M. and crop residues etc.

PLAN OF WORK

Plan of work is the blueprint that the extension agent follows in his teaching or in his programme.

A written plan insures careful planning and is evidence that planning has been done.

Method is the planned procedure or the sequence of events the extension agent plans and uses to help the people accomplish their objectives.

A carefully developed plan of work contributes to good method, it helps to avoid omitting essential elements of a programme, it provides a timetable for a programme, it helps to keep proper emphasis on the various parts of the total programme and it gives the extension worker confidence and direction.

The essential elements of a plan of work for achieving an established objective relative to a recognized problem are :

1. Identification of who is to be reached.
2. Delineation of the jobs that need to be done (specific objectives) which will lead to the accomplishment of the established general objective.
3. Selection of subject matter or information needed to accomplish the objectives.
4. Determination of how each job need be done in order to provide adequate learning situations and experiences.
5. Designation of responsibilities for each job that is to be done.
6. Determination of when (calendar of work), each job or activity is to be done.
7. Identification of evidences of accomplishment which will be expected as results.

DEVELOPMENT OF INDIVIDUAL FARM PLANS THROUGH GROUP PLANNING

M. HARRISON TAYLOR

SITUATION

Agricultural resources such as soil, water and climate are adequate for high production but must be used in the right combination with sound plant, soil, water and farm management practices.

Materials, supplies and equipment are needed in adequate quantities at the proper time to insure high production.

Cultivators are intelligent and conservative in their thinking, although few are literate. Their personal resources are limited in most instances but they try to make maximum use of what resources they have or can control.

The cultivators will follow a leader and accept proven practices which they have seen and understood or that have been successfully demonstrated by another cultivator in their area if it can be done with their resources. They are aware of many of the limitations of securing high production which are beyond their control.

I. Objective.

To develop individual farm plans with cultivators based on sound agricultural production principles of soils, plants and management as applied to their lands and operations and that will result in increased food production, income and resources for the cultivators and advancement of the village and community.

II. Purpose.

A. To assure a common basic understanding of plant, soil and water management practices by both the cultivators and field workers as applied to high agricultural production. The information presented will be heard and understood by all members of the group, as a result the cultivators will be in a position to discuss the material with neighbours and friends.

B. To coordinate and make effective use of staff members time and resources available with assurance that technical and practical information presented and applied will be understood and supported at all levels of operation.

C. To assure that maximum use is made of the cultivators own resources and materials and that his additional needs for materials, equipment and credit are scheduled in a systematic manner and recorded in a farm plan by which the cultivator can apply good management practices to his lands and operation for securing high sustained production and a system for effective "follow on" operations.

D. To create a feeling of responsibility and initiative on the part of both the cultivators and field workers for the development and application of farm plans to the land and instil a "live and fresh" approach to agricultural development in general.

E. To create a greater awareness among cultivator of common problems which might best be solved through cooperative action, thus serving as the basis for village planning activities.

III. Organization.

A. The Sarpanch and Agriculture Extension Officers (Agricultural Inspectors) will assist in organizing groups

of 18-24 cultivators through local leaders and schedule meetings in consultation with the Block Development Officer and District leaders. They will arrange for the meeting places and facilities. The A.E.O. will be responsible for the technical and administrative portion of the group meeting as related to the Circle, Block and District Headquarters.

B. The group planning will be carried out by members of the Circle, Block and District staff, supplemented by such resource people as deemed necessary and are available.

IV. Planning Meetings.

A. First Meeting :

1. Organization, Purpose and Procedure to be Followed. (start farm plan proforma)

2. Present Land Use :
   a. Soils and how they differ.
   b. Land management problems.

3. Soil and Land Management Tour :
   a. Physical characteristics of soils.
   b. Effect of farming practices.

4. Closing and Review.

B. Second Meeting :

1. Opening:
   a. Announcements.
   b. Review of First Meeting.

2. Crop Sequence:
   a. Kharif—high and low value,
   b. Rabi—high and low value,

3. Plant Requirements :
   (a) Root zone conditions.
   (b) Cultural practices.
4. Cropping Practices:
   (a) Varieties.
   (b) Seeding rates and spacing.
   (c) Fertilizer and Manures.
5. Selection of Crops and Crop Sequence.
6. Farm Plan Proforma Cropping Plan.
7. Closing—Review

C. *Third Meeting*

1. Opening:
   (a) Announcements.
   (b) Review of Second Meeting.
2. Plant Protection.
3. Water Management.
4. Land Protection.
5. Labour Machines and Power.
6. Livestock Programme.
7. Closing and Review.

D. *Fourth Meeting* :

1. Opening.
   (a) Announcements.
   (b) Review of Third Meeting.
2. Horticulture Programme.
3. Wood Products Used and Needed.
4. Farm Organization Summary.
5. Complete Farm Plan Proforma.

6. Schedule of Operations.
7. Arrange Necessary Demonstrations.
8. Closing—Review of Meetings.

Complete and detailed outline must be prepared for each meeting including material to be covered, questions to be discussed and answered and techniques and materials to be used.

Technical sections for use in presenting the basic agricultural information must be available for use and guidance of the Planning Staff.

ESTABLISHING AND USING RESULT DEMONSTRATIONS

Vernon E. Ross*

There are four major problems which we encounter in setting up and using result demonstrations. The first of these major problems is that of setting up the demonstration. Under the problem of setting up the demonstrations, we would like to discuss four difficulties which we encounter.

The first of these difficulties is that of leaving no check plot. We say that a fertilized field for example, where no check plot is left is no demonstration. A demonstration is set up with the idea in mind of teaching the farmer the difference between his old practice and the new practice which we wish him to adopt. If there is no check plot there is nothing for him to compare. Hence th[illegible] poor teaching situation.

The second difficulty which we encounter in connection with setting up demonstations is that of leaving the check plot across a road or across a bund not within the same field.

Your farmers are very intelligent people. They ask the same questions we would expect intelligent people to ask. They will immediately say the larger growth you are getting is not due to the new practice but it is because of the more fertile field. Why would we want to set up a check plot, across a road or across a bund if we know that we create in the farmer's mind a question as to whether the fields are of the same fertility.

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The third difficulty of setting up demonstrations is that of the failure to take into recognition the border effect. It is very desirable that we set up demonstration plots as close to the villages as possible. By doing this a large number of people will be able to see the plots. Therefore, we need to avoid the border effect that we often get by using locations close to a village. For example, if we lay out our plot along the road, parallel with the road so that the check plot is in front there will be little difference between the fertilized plot and the check plot in front, due to the border effect.

On the other hand if we lay out our plot parallel with the road and the treated plot is left in front next to the road then we will get an exaggerated effect and the farmer again will point out that the increased growth is not necessarily due to fertilizer but may be due to human along manure the border.

Another difficulty with laying out our [illegible]tion plot parallel with the road near the vil[illegible] we must leave the road and go down beside the [illegible] before we can see the line of contrast.

The fourth difficulty in connection with setting up demonstrations is that of lack of uniform practices. For instance if we are interested in finding out the influence of fertilizer we will want to keep all the other practices uniform. For example, if we apply farm yard manure to the check plot, we will want to apply the same amount of farm yard manure to the treated plot. If we cultivate the treated plot, we will want to cultivate the check plot. If we weed the treated plot, we will want to weed the check plot. If we apply plant protection sprays to the treated plot, we will also want to apply sprays to the check plot. It is very very important that we keep these practices

uniform on both plots so we can contribute the difference we see or is measurable at the time of harvest, to the practice that we wish to test.

Now we have indicated to you some of the difficulties in setting up demonstrations, let us now turn our attention to how demonstrations should be set up. Our first example here indicates that we might lay out our treated plot directly beside the check plot within the same field or within the same bund.

However if this is done, we will have only one line of contrast. That is, the line where the check plot and the treated plot meet. This kind of plot is effective if we obtain a good line of contrast. This kind of plot should be layed out perpendicular to the road, so that the contrast can be readily visible. This is the usual type of demonstration. This is the way we would ordinarily lay out a demonstration plot. However, we have discovered in our work at Hebbal in working with fertilizing dry-land ragi, that this is not the best type of demonstration. In the beginning when we are trying to get farmers to set up demonstrations, we make the appeal to them to try only on a small area to find out for themselves. In this case, we recommend that they treat only a small plot perpendicular to the road and that this be down the centre of the field, so we can have a check on either side of the treated plot. This gives us what we term a double barrel demonstration. When laying the plot out in this manner we have two lines of contrast—two places where the check plots and the treated plot meet.

Later on it will be desirable to change the demonstration so we will have the check plot in the centre of the field and the treated plots on each side. After the farmer is convinced that the new practice will pay. He will want

to apply the new practice to the whole field and thus it will be difficult to get him to leave a check plot. Therefore, if we suggest that he lays out the check plot may be only twenty feet wide across the middle of the field it will not take up too much space and he will be more likely to co-operate. We will still have our double barrel demonstration in this case, that is, we will still have the two lines of contrast or two places where the check plot and the treated plots meet. This gives a very nice visual picture and creates an excellent teaching situation.

The second major problem we have encountered in doing demonstration work at Hebbal has been that of holding a sufficient number of educational field days. It is difficult to get farmers in sufficient numbers to see the demonstration plots so they can be told and shown what has gone on. We do not say that we have all the answers to this problem. Certainly, if we invite important people such as Ministers and other important officials it is easy to get people out. However, we cannot always have these people at our command. Thus, it is necessary for us to explore other ways to get our villagers out to the demonstration plots so that we can show and tell them what has been done.

We say that the demonstration plots are our class rooms. We say that we would not attempt to teach our children to read and write without sending them to school. Therefore, we do not think it will be easy to teach our farmers to use fertilizer or other new practices unless we can get them out to our demonstration plots and show and tell them how to apply the new practices we wish them to adopt.

The third major problem which we have encountered in doing demonstration work is that of getting sufficient

plots harvested so as to obtain the statistical data that we need to tell farmers more exactly what they can get in terms of increased yield if they follow our recommendations. It is imperative that we harvest the check plots and treated plots, in sufficient numbers so that we can tell farmers what they can expect to get in return for following a new practice.

The fourth problem we have encountered is that of supplying teaching aids. Our farmers, are human beings just as we are and they tend to forget what the contrast was like between the treated and untreated plots as time passes. For an example, when they see the demonstration plot growing they may be very impressed. They get a mental picture of what the difference is between the treated and the untreated plots, but before the planting season rolls around this picture has become blurred in their mind. There is a great need for us to use photoes, slides, movies, and sample specimens so that we can rekindle in their minds the mental image that they got when they saw the demonstration plots during the growing season.

We are convinced that if we can overcome these four major problems which we have discussed, that we would have an educational programme that would make an impact on farmers anywhere. We further believe because of the illiteracy, among our farmers it will be necessary for farmers to do most of their learning through their eyes. Thus, we believe that the result demonstration is the method we will be using extensively in India for many years to come. In other words this is a show me programme. Your farmers at the present time do not believe what the extension workers tell them. They must be shown if we expect to motivate them to use new practices.

FROM THE DEMONSTRATION STAGE TO AN ADOPTION STAGE.

K.D. JALIHAL

Introduction

All Extension workers know that Demonstration work should be developed stage by stage till the continuous growth of the demonstration work results into the adoption of improved practices by farmers in that area. To be specific the demonstration work should be developed into 3 stages.[1]

1. *Test or Trial Demonstration Stage :* This is the first step when we determine whether local conditions give the same results as obtained elsewhere. The number of such demonstrations may vary from 1 to 10 per block.

2. *Early demonstration stage :* This is the second step when the extension workers of the block and local leaders should get sufficient confidence about the suitability of the practice. This can be done by demonstrating to few of the most interested or important farmers of the block. The number of such demonstrations may vary from 10 to 20 per block and such demonstrations may be repeated for 1 to 3 years depending upon the type of practice.

3. *Late Demonstration Stage :* This is the third step needed for setting up hundreds of demonstrations per block to assure sufficient positive results to change farmers minds. Five to 10 demonstrations per village may be required to be set up for 1 to 3 years depending upon the type of practice.

There is no one way of doing this demonstration work. However, it might be necessary to know the results

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[1] H. W. Gilbertson and Gladys Gallup, Result Demonstration Manual for Extension Workers—Agricultural Hand Book 123 (Washington, D. C. U. S. A. : U. S. D. A. Federal Extension Service), 1957 P. 14.

of different types of procedures followed in several areas of India and in other countries so that understanding of these experiences will enable any extension worker to select and use the procedure best suited to his situation It is with this idea that I am presenting the experience of the Extension Wing at Hebbal in Mysore State in attempting to effect a breakthrough from the demonstration stage to an adoption stage.

OUR EXPERIENCE AT HEBBAL

Our experience at Hebbal is in regard to the practice of fertilizing dryland Ragi and extends over a period of five years.

The Situation :

The department has recommended the use of fertilizers on dry-land Ragi since 1956 and even earlier. Demonstrations both by the agricultural department and by the Community Development block have been conducted in the Bangalore North Taluk block since 1956. However, till the end of 1959 not a single farmer was using fertilizers for dry-land Ragi as reported from a survey conducted by the Hebbal Extension Wing.[2]

We analysed the situation in 1959 and found that the demonstration programme had not even developed confidence among the block staff. It is needless to say that the programme had completely failed to motivate farmers. On further analysis, we noticed that the demonstration work undertaken had not fulfilled the basic requirements which I deal with a little later.

Trial and early demonstration stage:

Since 1959 we started working closely with the block staff in educating farmers to popularise the practice of fertilizing dry-land Ragi. In 1959, few trial demonstra-

² Mcleod J. H. A simple survey on what farmers know-Mysore State, India, December, 1959 (unpublished Mimeo) Page 14.

tion plots were set up at Government cost and the practice gave good results under local conditions. We worked in the next two years *i.e.* 1960 and 1961 to set up few demonstrations at Government cost to develop confidence among the block staff and local leaders. We emphasized four basic requirements in this work. (1) Care was taken to set up good demonstrations with check plots (2) We conducted educational field days (3) Visual evidence like photographs were taken, of the demonstration plots (4) Harvests were made in the presence of farmers and the cost and return and net profit calculated.

Problem in expanding to late demonstration stage :

Our work in the early demonstration stage did develop confidence among block extension staff towards the practice. Even some farm leaders were impressed. However, the block staff had to face new problems. When they approached farmers to use fertilizers and explained the results of previous demonstrations, farmers started demanding free fertilizers. Even those farmers who themselves were demonstrators also started demanding free supply. We were faced with two alternatives in expanding the programme to late demonstration stage. Either to give Government fertilisers to hundreds of farmers to set up trial plots or to find out other methods without using free supply of fertilizers to set up the plots. The first one was an easy method as we had the full financial support from the U.S. AID. But we gave further thought to the problem. We wanted to find out answer to this question. Why even those farmers who had set up demonstrations in the past at Government cost continue to demand free supply ?

It was observed that the farmers' thinking was not stimulated in terms of the economics of the practice due to the free supply of fertilizer and we thought that it may

not likely to be stimulated even by increasing the number of demonstrations if the free supply is continued. So we decided to develop the late demonstration stage without using free supply of fertilizers.

Late Demonstration stage with new approach :

The new approach we accepted did create a challenging situation. Most of the extension workers with whom we talked were doubtful about the success of this approach. They said, "we don't think farmers will agree to set up trial plots unless we give them free fertilizers". To use the words of Dr. Carl Taylor, "They could not quite believe that village people would come forth with enthusiasm to work on the solution of their own problems[3]. On our part, we had not attempted to find out the reactions of the farmers till then. So we decided to have a village meeting to find out the farmers reaction. The first meeting we had was hurriedly planned and we were not equipped with any teaching aids. The meeting had to be conducted in the residence of the Gramsevak with a hurricane lantern. We explained the results of the demonstration conducted in the early demonstration stage touching on the economic aspect and then appealed to farmers to try the practice. Some farmers did ask whether fertilizers will be supplied free. We frankly but politely told them that they will have to meet the cost. The further response we had, gave us enough confidence in the method we had chosen. Six farmers volunteered to try the practice at their own cost.

The meeting also clearly indicated that no attempts had been made to educate farmers and it further showed that farmers are thirsty for new information and are ready to try new practices at their own cost if it is going to raise their income. Then we said, if such a simple meeting and that too a hurriedly planned one, where we could not use any teaching aid should give us this response,

[3] Carl Taylor, "Two Major Evils" Kurukshetra Jan. 1959, Page 379

We could expect better response with well planned educational work.

Educational work in 1962 :

A little more thinking assisted us in developing a well planned educational programme which we implemented in 1962 to develop the late demonstration stage. We followed eight steps to carryout this educational work.

1. *Publicising the results:* We gave wide publicity to the results obtained during the early demonstration stage. Two simple charts were prepared giving the economic advantage of the practice. These charts were exhibited throughout the block.

2. *Conducting educational meetings :* In summer, twenty village meetings were conducted mostly during nights so as to involve more of the farmers. Economic importance of fertilizing dry-land Ragi was explained to farmers with the help of the charts already mentioned. Photographs and slides of the plots during the early demonstration stage were also used as evidence to motivate farmers. Each meeting lasted for about 1: ½ to 2 hours which facilitated a thorough discussion.

3. *Appealing to farmers to try the practice at their cost :* At the end of each meeting, an appeal was made to farmers to come forward and try the practice at their own cost. In many cases challenges were offered and accepted. This resulted in getting a list of some 400 farmers to volunteer.

4. *Assisting farmers who volunteered to try the practice :* A simple leaflet was prepared giving the details of the practice. This was given to each farmer who volunteered. Frequent follow up visits were made to villages to contact these farmers and to assist them in carrying out the trials. These visits also helped in enlisting more farmers.

Co-operative societies were contacted and encouraged to stock fertilizers in time. Method demonstrations were conducted to teach the farmers how to apply fertilizers. As a result in 1962, 130 farmers in 31 villages of the Bangalore North Taluk set up trial plots at their own cost. This response was obtained even without assisting farmers to get credit. Care was taken to see that a check plot was left in each farmer's field. Another 50 farmers must have top dressed their crop due to indirect effect, being impressed by the fertilized plots and knowing that the demonstrator farmers had purchased their own fertilizers.

5. *Conducting educational field days* : Organised, simple educational field days were conducted at these several plots during the crop season when hundreds of farmers observed the difference between the fertilized and the unfertilised Ragi crop.

6. *Involving Administrators and local leaders* : Attempts were made to show these plots to administrators like the Deputy Commissioner and Asstt. Commissioner. Local leaders including Taluk Board and Panchayat members were also taken round the plots. This helped in enlisting their full support to the programme.

7. *Collecting visual evidences* : Photographs and slides were taken of the plots with the farmer groups. A coloured movie was also shot.

8. *Harvesting in farmers' presence and working out economics* : The plots were harvested in the presence of farmers to compare the yields of the fertilized plots with check plots. When the weights were recorded in farmers' presence and economics worked out, their thinking was stimulated in terms of the profit. All farmers trying fertilizer were pleased at the results they obtained.

Educational work in 1963 :

In Bangalore North taluk the Demonstration programme was expanded this year to cover more villages, by taking up intensive educational work on the lines carried out in 1962. Many other Community Development Blocks came forward to take up similar demonstration work without promising free fertilizers to farmers.

The results obtained in 1962 from 100 farmers fields encouraged this years' work. A simple folder was prepared giving these results which attracted the attention of farmers everywhere.

In publicising the results in 1963, a new method of using Road banners was tried for the first time.

The effectiveness of the village meetings was increased this year due to the use of the following aids.

1. Slide presentation.
2. Movie film show involving the local experience.
3. Use of photograph flash cards.
4. Simple flannel presentation of last year's results.
5. Use of demonstrator farmers as resource persons.

The same technique of appealing to farmers to try the practice at own cost was continued in the college block and was initiated in other blocks. The whole procedure worked out very well as evidenced by the involvement of a large number of farmers in the programme.

We see new trends : We feel that signs of a definite break-through from demonstration phase to adoption phase are now observed in our block and also in other blocks as seen from the following trends.

1. Six hundred farmers in 96 villages of the Bangalore North Taluk block have used fertilizers on dry-

land Rangi in 1962 as compared to 130 people in 31 villages in 1962.

2. Farmers who heve used fertilizers during 1963 are very much enthused with the results and have decided to continue the practice.
3. More than 50 farmers in the college block have not only used fertilizers for two years in succession but also have put more area under fertilizers during the, second year as compared with the first year. In many cases the area fertilized is above 2 acres with a maximum of 42 acres.
4. No farmer who has tried the practice at his own cost is demanding free fertilizers.
5. Farmers' thinking has been changed during these two years. The questions they are now asking are different from the previous ones.

Seven General Characteristics of the Learning and Teaching Process.

A. Learning is growth-like and continuous.
   1. Begin where the learner is.
   2. New must be related to the old.
   3. The pace must be adjusted to the learner's capacity.

B. Learning is purposeful.
   1. Learning must make sense to the learner.
   2. Progress must be constantly appraised and re-directed.
   3. Purposes must be kept in sharp focus.

C. Learning involves appropriate activities that engage a maximum number of senses.
   1. Learning results through self-activity.
   2. Activities appropriate to the specific learning situation must be used.
   3. Learning activities should engage a maximum number of senses.

D. Learning must be challenging and satisfying.
   1. Teacher motivation of the student is essential in making learning more challenging.
   2. Appropriate and timely recognition should be given to student achievement.
   3. Standards demanded of learners should be suitable to their ability.

E. Learning must result in functional understanding.

1. Memorization alone is temporary unless reviewed or put to use in a practical situation.
2. Course content should be organized into meaningful units.
3. Activities that stimulate use situations are most affective.

F. Learning is affected by emotions.

1. The teacher should strive to increase pleasant emotions and decrease unpleasant emotions of students in connection with the learning process.
2. The intensity of emotional feeling affects learning differently in different individuals.
3. The expression of emotions is highly trainable.

G. Learning is affected by the physical and social environment.

1. The general physical environment should be suitable to the kind of learning taking place and to the activities selected for use in the learning situation.
2. Specific physical factors of the meeting place should be suitable to the kind of learning taking place and to the activities selected for use in the learning situation.
3. The teacher should recognize and utilize the effects of the social environment on learning.

INCREASING FARM INCOME

Dr. Neal R. Carpenter

Introduction :

I. During the Work Seminar the group must have done the following things :-

(*a*) Problems in Extension training,

(*b*) Problem identification through observation,

(*c*) Elements of problem solving—the extension worker—-cultivator—-technology—-communications—services and supply.

(*d*) Developing extension programmes.

(*e*) Developing plan of work for V.L.W. and A.E.O.

(*f*) Meeting the requirement for technical subject matter.

(*g*) How to put knowledge to work in the village.

(*h*) Communications.

(*i*) Demonstrations in Extension and how to lay result demonstrations.

II. You have studied the above mentioned items and I will assume you have all understood it with this understanding I think the objective of the present seminar is "To train the trainees from Agricultural colleges who are associated (responsible) for the training of Extension officers (Agri). in order that they may adopt a problem oriented approach". The problem oriented approach is to solve the problems of the cultivator so as to provide better income. The subject for discussion is increasing farm income. Everything you have been taught is related to increasing farm income—salesmanship, techniques, communication & technology.

III. Before I begin we must determine what are your objectives when training the A.E.O. ?

Objective : To create a desire in the persons you train to have a sincere goal of improving the lot of the cultivator.

(*a*) *Why is this true* ?

If he really has this desire he will be eager to extract everything from you, understand it and try to apply it with the cultivator.

IV. If the above is a true objective (problem) for you in relation to your students; what is my objective (problem) in relation to you ?

1. To create a desire in you,—to create a desire in your students to make a success of the cultivator. Why is the above true ?

Because if I do not you will not, hear a thing I say as far as understanding in concerned.

V. How do I create that desire in you and how do you create the desire in your students ?

First let us review the past.

How does man or (has man) been able to succeed in India during past years. (Granted there have been many exceptions to the following in the past and there will also be mistakes in any new future plan).

(*a*) Seniority has been weighted very heavily.
(*b*) Who you know has been of prime importance. (This will always be true in all countries to some extent).
(*c*) "Pleasing" those above has been helpful.
(*d*) Dont' argue points, but praise those in "decision making" positions.

(*e*) Marks.

(*f*) Constant salary; No rewards for outstanding work.

Why was this true?

System of past-all decisions at the top.

The Future Review.

Development System.

Orientation changed.

(*a*) What you know and can produce.

(*b*) "Please" those "BELOW" in order to please those above.

(*c*) Present solutions to problems to superiors and help them make decisions that will show results.

(*d*) Seniority may sometimes be a handicap also "Who you know".

(*e*) Marks of value only if backed by results.

(*f*) Salary to results.

Cite evidences of this change : Entrance to PAU New Director of Agricultural approach, New division of Commerce.

What do I present to-day ? Not Farm Management but an outline of *your* knowledge that must be passed on (with DESIRE) for success of others to students.

(*a*) You have the salesmanship.

(*b*) You must have ambition to keep trying it.

(*c*) Since you have the technique of how to extend, you must concentrate on what to extend.

My presentation gives an outline of the "what" items which are all related to increased income :

Points: Many things make a difference in income and you to be a successful, person must know them all for your subject.

Use the partial outline which follows to start preparing a reference manual if you are serious about your success and the success of an AEO, then teach them how to use it effectively.

Notes of explanation regarding possible uses that may be made of the following outline when you are training AEOs and VLWs.

The factors listed under (A) are the farmers actual resources which you as an Extension Worker may not be able to change with normal extension approaches. You should teach your AEOs to learn from the farmer how much of each factor the cultivator has because the quantity of each (land, labour & capital) with the farmer will limit many of your recommendations.

All of the factors under (B) are those items that affect farm income and the difference between successful farmers and poor will usually be found when you compare what each farmer is doing in relation to each item listed.

Normally when using the farm Management Extension approach we try to motivate the cultivator to 'change' by helping him determine what net cash income (excluding depreciation) be made last year. Simply calculate his gross sales and substract from this amount his cash costs. Usually the farmer will not be satisfied with the income. If he is not, get him to specify what income he desires. The difference between the two (what he wants to earn minus what he now earns) will give both you and the farmer a place to start looking for weaknesses or errors in his farming operation.

Have your AEOs go through the list on a farm and tell what items the farmer is doing correctly and which ones he is not. If you will alternate between good farm

operations and poor ones AEOs and VLWs will have a chance to learn, first hand, what is proper and what is not in terms of increased income.

Next, you as a trainee with other concerned experts list the various items in terms of their importance for yielding high returns when done correctly and low returns when not done properly. Plan your extension programmes to correct the most paying ones first.

You may also use this outline to prepare reference material for your AEOs and here is a correct method or quantity under each item. Put the information under one cover as the Extension worker has up-to-date and ready references.

Additional factors which contribute to farm income immensely and which are included in the science of Farm Management are:-

(*a*) Select the most profitable crops to produce.

(*b*) Select the method of doing the job in the least expensive manner. (Remember sometimes it may cost slightly more per unit to do the job but this might still be the best method if it permits the farmer to save labour he can use elsewhere or permit him to market produce early at a higher price.

(*c*) Help farmer determine how much of each enterprise to grow so that he does not encounter labour difficulties of having two much work for a few months and very little in others also to spend his limited capital on the most profitable enterprise.

(*d*) Help farmer decide where he can buy (most cheaply and (sell at higher price).

(*e*) Help farmer determine when to buy (most cheaply and to sell for higher prices.

The major factors in increasing farm income are:

1. To motivate farmer to want to earn more.

2. To demonstrate to him that you have a desire to help him.

INCREASING FARM FACTORS

Factors that have an effect on farm income are as follows :

Land:

Soil type
Drainage.
PH
Water table.
Basic Fertility level (potential).
Sub-soil (compact layers or Hard pan)

Labour:

Labour supply (family) age, health etc.
Ambition.
Skill of labourers in performing operations.

Capital:

Cash on hand.
Net worth.
Whether fixed or liquid.
Credit rating.
Amount of credit available.
Interest rates.
Repayment arrangements.

MANAGEMENT OF FACTORS UNDER FARM CONTROL

1. *Irrigation.* (What is correct in relation to each item for the farmer you are trying to help).

(*a*) Source-Pumpset, tube-well, Persianwheel.

(*b*) Lay-out, field slope, length of channels. Lining of channels, methods of applying *i.e.*, row siphon, flooding, sprinkling.

(*c*) Amount to apply per irrigation for various crops.

(*d*) When and how often to apply for best results.

(*e*) How to manage the watering when salt content is high.

I. *Fertility Programmes* (understanding of how much when & how & doing.)

What is correct for the farmer you are helping for each crop?

(*a*) Use of Nitrogenous fertilizers.

(*b*) Use of Phosphate. ,,

(*c*) Use of Potash ,,

(*d*) Use of Farm yard manures and their care.

(*e*) Use of Compost.

(*f*) Placement of fertilizers.

(*g*) Time of applications of fertilizers.

(*h*) Quantities according to needs :-
by soil test, by past yields.
by hunger signs, by soil type potential

(*j*) Use of trace elements for some enterprises.

(*k*) Crop rotation.

Cultural Practices : (Is your farmer doing each correctly?)
Timings.

(*a*) Timings of preparation related to sowing. Date of crops, moisture conditions of soil, competition with other work.

(*b*) Seed bed preparation.

(*i*) Number of plowings.

(*ii*) Depth of plowings.

(*iii*) Smoothing.

(*iv*) Implements used.

(*c*) Seed factor. (A mistake in the items below is usually a costly one).

(*i*) Variety (to fit conditions).
(*ii*) Seed rate.
(*iii*) Germination.
(*iv*) Seed quality.
(*v*) Seed treatment.
(*vi*) Depth of planting.
(*vii*) Uniformity of seed distribution.
(*viii*) Spacing.
(*ix*) Sowing dates.
(*x*) Broadcasting Vs. drilling Vs. dropping through pour.

(*d*) Hoeing and Weeding.

(*i*) Number and efficiency and timing.
(*ii*) Whether by hand, by machine or by weedicide (which should your farmer use, prove by calculations).

(*e*) Plant Protection (Ignoring these can be very costly).

(*i*) Materials used and mixture.
(*ii*) Quantities used at what time.
(*iii*) Method of application *i.e.* spraying Vs. dusting.
(*iv*) Soil treatments with insecticides.
(*v*) Methods of disease control *i.e.* seed selection, topping, removal of diseased plants etc.

(*f*) Harvesting

(*i*) Timliness.
(*ii*) Method used: Machine (many sizes) Vs. hand

(*g*) Marketing:

(*i*) Quality produced (Result of many factors).
(*ii*) Time of marketing.

(iii) Storing.

(iv) Treatment of storage facilities and stored grains.

(h) Organizational Problems.

(i) Select enterprises that produce the best profit.

Compare enterprises for gross income, cash costs, labour required, risk. Select the most profitable the farmer can fit into his land, labour, capital and knowledge.

(ii) Select the cheapest and most efficient way of doing the many operations, figure cost per unit of produce.

(iii) How much of each enterprise; land considerations (Rotations) disease, Build up, soil management. Labour considerations; even distribution, so farmer can employ labour evenly.

Capital; put it in the most profitable first where it will yield largest return (not always true on increment basis). Management; Keep farmer on secure ground in terms of his knowledge, New enterprises require new knowledge, & skills, start small (Demonstrations) work up.

The programme should be based on conditions that exist (village, block, district and national).

APPLICABLE PRINCIPLES OF LEARNING AND MOTIVATION.

BADRI SINGH

A few definitions :

Teaching: is a process of guided interaction between the teacher, the student and the materials of instruction- Teaching is directing the learning process.

Learning is the process by which one, through his own activity, becomes changed in behaviour. It is the modification of behaviour through experience and training. Learning is the acquisition of new behaviour patterns, or the strengthening or weakening of old behaviour patterns, as the result of practice.

Motivation: is activity by one person designed to stimulate or arouse a state within a second person or group that under appropriate circumstances initiates or regulates activity in relation to goals; or it is the aroused state of the individual that under appropriate circumstances initiates or regulates behaviour in relation to goals.

I

The programme should be based on conditions that exist (village, block, district and national)

It means personal contact with and thorough observance of the environment, the people, the social structures, the economic status, the habits, the traditions and the attitudes, in fact, everything about the area in which the job is to be done.

The action needs to be related to the available resources of the community. It is education that recognizes

the psychology and habits of the people in each community and utilizes those techniques that, in terms of local interest and understanding, have maximum effectiveness.

It should be achievable considering such factors as person, finances, time and facilities. It should be oriented to the existing technical, economic and social level of the rural people. It should fit in with the local resources in soils, manures, irrigational facilities, availability of improved seeds, type of implements used and the cultivation practices.

II

Activities undertaken must correspond to the basic needs of the people.

People are motivated to learn if they can satisfy a basic need through learning. Basic needs, wants, or desires have been classified as follows :

1. The desire for security—economic, social, psychological and spiritual security. Several programmes in the sphere of agricultural extension, such as some new seeds and improved implements, are accepted for their visible economic advantage. The items of land reforms are welcomed by the people because of the considerations of social and economic security.
2. The desire for new experience—adventure, new interests, new ideas, new friends, and new ways of doing things. Several items of the programme are tried out of curiosity, some others are enthusiastically adopted because they are so novel. The people are motivated to accept some ideas in a spirit of compliance to the wishes of the extension workers in order to maintain friendly relations.

3. The desire for affection or response—companionship, gregariousness, and social-mindedness, the need for a feeling of belonging.
4. The desire for recognition—status, prestige, achievement, and being looked up to. Cooperation with the programme opens up the possibility for some individuals to acquire a position of leadership in the village. Adoption of progressive ideas or ownership of a soil-turning plough, or a tractor or an orchard adds to the prestige of the family. Construction of irrigation wells adds to the prestige of the village.

It becomes the job of the extension worker to under stand the basic wants or incentives of the people with whom he is working. The need for a larger income may be the incentive to the farmer to learn improved practices in agriculture. The stronger the desire the more intensive will be the mental and physical effort which he will put forth.

The programme should be based on the needs of the people as they feel them. Most of them want some kind of improvement in diet, housing, clothing, health, education, personal or community relations.

Problems should be selected for action which will meet recognized needs.

Under voluntary conditions of participation, people concern themselves with programmes of change only when they think that the programme is valuable to them in meeting personal, family, group or community needs which they themselves recognise.

From a psychological standpoint, Dr. Leagans has classified needs into two groups, *viz*, felt or consciously recognized needs and unfelt or un-recognised needs. All needs must become felt before they serve as motivating forces. Adults often are not aware of many of their most

important needs. Adults have needs which are unfelt. Significant needs of which people are not conscious must be brought out and met in order to help them advance toward more desirable economic and social conditions.

One of the problems for extension workers is to help people identify important needs they do not recognise, then plan educational effort to convert these into felt needs.

Some needs of agricultural extension officers are :

1. Planning extension programmes.
   (*a*) Farm production plan.
   (*b*) Village agricultural production plan.
   (*c*) Block agricultural production plan.
2. Training lay leaders in specific subject matter and in teaching methods.
3. Leading general group discussion.
4. Organizing young farmers clubs.
5. Giving method and result demonstrations.
6. Working with opinion leaders.
7. Organizing crop competitions in the block.
8. Planning crop campaigns in the block.
9. Directing and supervising the work of the village level workers.
10. Understanding team work.

Some Needs of farmers :

1. Successfully established in farming.
2. Increasing and profitable production.
3. Achieving social and civic responsibility.
4. Maintaining an economic standard of living.
5. Rearing children and assisting teen-age children to become responsible and happy adults.
6. Finding a congenial social group.

III

Learners should have clear objectives.

No one, either as an individual or as a member of a group, can act to the best purpose until he has definitely decided what he wants to do. The importance of clarifying objectives and goals is found in two major truths;

1. The subject—matter and method necessary to attain educational ends can be wisely selected only when the objectives are specific and clearly stated.

2. Evidence of the effectiveness of extension activities can be collected only in the light of specific and clearly defined objectives.

The first step in economical learning, in other words, is to establish the goal as clearly and explicitly as possible. Then, after each attempt to execute the skilled behaviour pattern, the learner must gauge the success of his performance by reference to the objective and adapt his responses in the next trial in the light of this evaluation.

Teaching objectives represent the learnings the teacher intends to secure in the learners—the changes to be brought about in the behaviour of the learners.

The problem is to utilize the motives and needs of participants to encourage them to work for goals that are regarded as educationally desirable. In the process of seeking these desirable goals behaviour changes take place. Educational experiences are designed to promote these behaviour changes.

Considered in terms of the agricultural extension officers, the objectives are :

1. To understand the background, philosophy objectives, policy and the extension system.

2. To know the problems and procedures of adult education.
3. To acquire skill in organising and presenting economic, social, and technical information to farmers.
4. To organise people and stimulate leadership among them and to help in programme development.
5. To understand the techniques and processes of evaluating the effectiveness of extension programmes.

Considering farmers, the objectives for the application of fertilizers to paddy crop will be as follows :

1. Knowledge to be learned.
   (*a*) How plants take in nutrients?.
   (*b*) What are the necessary plant nutrients?.
   (*c*) The limiting nutrients in the region.
   (*d*) How nitrogen is related to paddy production?
   (*e*) Relation of cost to yield and profit.
   (*f*) Where to find reliable information on fertilizers.

2. Attitudes to be developed.
   (*a*) The desire to produce a good yield of paddy.
   (*b*) The feeling that it is profitable to apply fertilizers to paddy.
   (*c*) Pride in applying fertilizer to paddy.

3. Skills to be acquired.
   (*a*) To determine the kind and amount of fertilizers to apply.
   (*b*) To buy fertilizers intelligently.
   (*c*) To apply the fertilizers (method of applying)

IV

People's participation in actions that promote their welfare.

There is no point in the philosophy of progressive education which is sounder than its emphasis upon the importance of the participation of the learner in the formation of the purposes which direct his activities in the learning process. (Dewey).

Learning is more rapid and efficient when the learner is a participant rather than simply a spectator.

The best way to learn is by doing.

When a person does something or says something in his own words it is much more likely to become a part of him than if he watches someone else do it or hears someone else say it.

Involvement of people in all of the activities of extension means involvement in planning programmes, determining objectives, setting up plan of work, carrying on actions, and evaluating results. People may need to be encouraged and educated to this kind of a role.

Each person must do his own learning because no one else can learn for him. People develop skills, habits. and the ability to solve problems through practice.

Continued practice is necessary for the retention of learning and for the development of habit. Few vivid, intense actions may be enough to learn whereas a score of half-hearted repetitions may be relatively fruitless of learning.

Extension helps people to help themselves through participation. It is education for action, action by in-

dividuals in improving their farm and home skills and management, their health and other individual needs, action by groups to improve such environmental, economic and social factors as production, marketing, purchasing, soil conservation, recreation and the like.

V

The use of group process.

Group process refers to the procedures through which a group of individuals approaches, attacks, and solves a common problem. It is a process of communication, that is, the procedures consist of thinking, suggesting, planning, deciding, acting, and evaluating as a group. This implies an apportunity for free face-to-face communication, leading to a consensus of decision and action. We may regard the group process as a group learning situation, and consider the group as the learner' rather than the individual. The goal of group processes is group productivity, that is, getting something done which could not be done by a single individual.

The principles of effective group action are :

1. A democratic atmosphere, or one which is permissive rather than punitive. All members must feel free to voice an opinion, to suggest, to disagree without fear of being ridiculed or losing status. The group interaction necessary to arrive at common decisions depends on a voluntary, spontaneous, cooperative effort, to which this atmosphere is conducive.

2. Communication must be goal-directed, not aimless conversation. It is aimed at establishing a consensus not a mere majority vote. Group decision by majority vote means practically that the majority is coercing a minority, and the defeated minority may in the end attempt to block action. The purpose of communication is not

to win an argument, but to be understood and to understand others. The group process is not a debate, but an attempt to clarify viewpoints.

3. Morale and discipline is group-centered. The emphasis is on We, not I. The suggestion of a member is judged according to its contribution to the group goal rather than as an expression of his individual goal.

4. Leadership is shared. Any member can be a leader by making a contribution. Leadership is not a matter of position or of dominance, but of membership in the group. A member may assume leadership in the discussion, relinquish it, pass it to some one else.

Kurt Lewin says, "It is easier to change the ideology and social practice of a small group handled together than of single individuals. Decision in a group setting seems to be effective even if the group is not a permanent organisation. Group decisions prove to be superior to individual treatment as a means of changing social conduct."

D. Sanderson says, "We must recognize that social progress comes through changing group attitudes and that groups rather than individuals conserve and transmit new social procedures and mechanisms".

One of the many assets a group situation offers in helping an individual to change is the differences which exist among group members. In almost any group of people there are some important differences of ideas, understandings, attitudes, information, or feelings. If differences do not exist in a group an individual will find little stimulation to change. In planning for change, a trainer or leader may need to arrange the group environment so that differences are present in the area in which change and growth are desired. A leader may invite resource people into the group to provide some of the differences.

If the resources of the group are to be used as much as possible to aid individual growth, there must be open communication in the group about anything where change is desired. Without open communication there is likely to be little opportunity for the group members to stimulate, encourage or support change.

Learning to express his differences in an atmosphere which carries no threat, a person can face himself, assume responsibility for thoughtful choices and decisions, recognize his weaknesses, use his strengths without defensively imposing them on others, and accept help from others. In the free and open exchange of ideas and feelings between the members of the group, no one needs to be competitive, no one has to win or prove himself right, no one has to be exposed to ridicule, sarcasm or condemnation. Together the members explore ideas or situations test their insights, old and new, through the combined contributions, and helpful criticisims of all the members and the leader.

Using problem solving in teaching.

Thinking is a determined course of ideas, symbolic in character, initiated by a problem and leading to a solution.

A problem situation arises, when progress towards the goal is blocked in some way, and when available, habitual response patterns are not adequate to permit the individual or group, to surmount the obstacle and proceed toward the objective. The essential factors in a problem situation are therefore a goal, an obstacle, and inadequacy of immediate responses. These are essential conditions for thinking.

Thinking is the most important goal of education. Teaching learners to think means first of all providing problem situations.

Productive thinking involves mental struggle. It is an attempt to answer this kind of question: what factors, intrinsic to the situation, need to be altered in order to reach a solution.

Gates and Associates write, "Problem solving occurs when readymade patterns of response are not adequate for overcoming an obstacle to the satisfaction of a need or the attainment of a desired goal. Problem solving is a form of learning in which the appropriate response must be discovered. The important features of the process are the selection of relevant data from past experience, the collection of all further pertinent information, and the reorganization of all the essential factors into a new pattern of behaviour which meets the demands of the problem situation."

Thinking comes very close to bring the method of an educative process. Problematic situations for the learners must exist if the learners are to think reflectively.

Enrichment of meaning, development of understanding, acquiring information in useful form, preparation for meeting new situations intelligently, all call for thinking. Training to think well in any given field or subject, say agriculture, is one of the desired results of instruction in it. If a person is to be taught to think in a field, he must think while he is being taught. One learns to think in a field or subject by thinking in it. Success in a field usually depends on the ability of the person to think effectively in that field.

Reasons for using problem solving.

Hammonds gives the following reasons:

1. The problem acts as a selective agency in gathering pertinent facts and organizing them into a connected

viewpoint. It tends to favour the perception of facts appropriate to the solution of the problem.

2. In problem solving, significant facts are taught in useful association and thus will be more likely to be used when the need arises.

3. The solving of a problem by the learner calls for the use of old things in new ways.

4. It contributes to the development in the learners of a habit of evaluation and using data intelligently in a new situation.

5. Since problem solving calls for pause and weighing of possibilities and alternatives, it contributes to the development of open-mindedness.

6. Problem solving lends itself to learner participation in all its phases or aspects.

7. The many variations in kinds of problems and methods of solving them give rich opportunity for flexibility in teaching procedure.

Group thinking in problem solving.

Group thinking is that orderly, cooperative process whereby the individuals of a group pool their individual thinking in order to reach a desirable goal or a satisfactory solution to a group problem.

R.L. Thorndike's summary of factors pertinent to cooperative thinking points up both advantages and disadvantages.

1. The group typically brings a broader background of experience to a problem situation than does any single individual.

2. The group is likely to produce more and more varied suggestions for dealing with a problem than will arise frcm a single individual.

3.. The diversity of viewpoints is likely to be more representative of the larger population from which they were drawn than is the viewpoint of the single individual.

4. As diversity of background and interest within the group becomes greater, it becomes increasingly difficult to reach a real agreement among the members of the group as to the definition of the problem and the values to be served. Reconciliation of conflicting goals becomes the real problem.

5. Just as a group is likely to produce a greater range of suggestions, so as a group is likely to be more productive in criticism of proposals and bases for rejecting them.

6. Interstimulation is a distincitive feature of group effort. The suggestion by X, which is criticized by Y, serves as the stimulus to Z for a new and perhaps quite different suggestion.

7. Interpersonal dynamics becomes a significant element. The assertive, the dogmatic, and the persuasive individual—each plays a distinctive role.

8. With increasing size and diversity of group memberships, unity and integration of effort are often difficult to achieve. Group members may show a tendency to ride off in all directions.'

In recent years, education has become increasingly aware of the importance of the social factors involved in cooperative problem solving. It can be an excellent way of motivating the individual to think and will serve to sharpen his concepts as well.

It is education that participation builds the individual mentally to exercise effectively his own thinking, judgment, and leadership in solving his own problems, and in co-operation with others, to solve group problems.

It is education that stimulates farm people to analyze and recognize their own problems and to take steps to solve them individually and collectively.

VII

Learning should be related to and should make use of the learners experience.

Adult farmers have more experiences, different kinds of experiences and are organised differently.

The most precious ingredient the adult farmer brings to a learning situation is experience. In the lifelong process, they acquire knowledge, skill and habits; they are capable of changing their ways of thinking, feeling, and doing, because every farmer is a cumulative, dynamic integration of experiences.

The presentation of ideas and knowledge, if it is to be meaningful to the farmers should be adapted to their level of experience. **It means relating and applying the generalizations being taught to the kinds of experiences represented in the group.** Adults learn by associating a new experience to a past experience by relating the unknown to the known. The members of any adult group will possess a quantity of varied experiences that can be used for the common benefit of the entire group.

Farmers have the tendency to fuse the new ideas with previous experience, thus acquiring new or clearer understandings, broadened interests, rational attitudes, improved patterns of thinking and behaving, and richer and more stable personalities.

VIII

Use a variety of learning activities or experiences.

This is based on the principle of multi-sensory approach. Messages reach the human mind through the senses, namely, seeing, hearing, feeling, testing and smelling.

The greater the number of sensory channels used in the learning process, the greater is the actual amount, of learning.

The functional learning experiences should be provided as far as possible, for example, hearing a talk, participation, in a discussion, observing demonstrations, laying demonstrations and use of visual aids.

Good teaching tries to reach any learner through as many avenues to the human mind as can be employed. A good teacher is skillful in using all teaching methods, varying them according to the requirements of the situation and the needs of the farmers. This helps to maintain interest, stimulate participation, and meet individual differences.

Learning involves appropriate activities that engage a maximum number of senses. Learning results through self-activity.—and activities appropriate to the specific learning situation must be used.

IX

Providing for individual differences.

Individuals differ in interests, abilities, attitudes, appreciations and understandings, habits and skills and in capacity to learn.

Learning ability varies widely among individuals. The level of communication and the level of understandability of the subject matter taught must be in line with the learners' ability, not only to understand what is taught, but to apply it to his problems.

Farmers differ in age, education economic status, status and proneness towards change.

Thorndikes' conclusions are:

1. There is a rather rapid rise in the ability to learn, slowing up somewhat as maturity is neared and reaching its height about the age of 22 to 25.

2. After the climax is reached, there is a gradual decline in learning ability, but the decline is so gradual that at 45 one is still as capable of learning as he was at the age of 18 or 20.

Adults learn as well as youths, but a little more slowly. Reasons are (1) Less acute vision and hearing. (2) Slower reaction time (3) Greater reluctance to learn, and increased fear of failure.

Because of less acute vision and hearing of adults.

(*a*) See that people are comfortable, can see what is done and can hear what is said.

(*b*) Mimeographed or printed material should be in large enough type to be easily read.

(*c*) Use simple, well chosen words that are clear and meaningful.

(*d*) Speak distinctly and slowly.

Because of slower reaction time of adults:

(*a*) Teach one thing at a time in logical sequence first the why, then the what, the how and the when.

(*b*) Repeat often.

(*c*) Give specific assignments that people can do.

Because of greater reluctance of adults to learn and their fear of failure:

(*a*) Continually ask for and use the practical experience of farmers.

(*b*) Give opportunity in meetings for their actual participation in discussion.

(*c*) Provide recognition. Give them help and encouragement; commend their initiative.

(*d*) See that they get satisfaction from their work.

(*e*) Employ every possible pictorial device to show relationship of ideas and materials.

The farmers differ in their ability to apply recommendations. The problem is to select the content of the teaching and make it so attractive that such differences are transcended and common interests and needs are brought into focus.

The desirable setting for functional learning experiences will provide for natural integration of feeling—doing—thinking.

Widely varied types of learning experiences should be provided, adaptable to levels of maturity, to different rates, interests, abilities, and so forth. Learning takes place at different rates of speed for different learners.

The agricultural extension officers are different in their:

1. Knowledge—about people, farming, the extension service.
2. Attitude—towards people and things.
3. Interests—in people, sports.
4. Skills—in doing things with hands and directing others.
5. Past experiences.
6. Conditions of health—vigour, endurance.
7. Goals—ambitions in work and living.
8. Habits—developed through repetition over many years. We all resist change from our established habit patterns.

X

Identification training and use of progressive farmers.

This is basic in any programme. The people trust and have confidence in the progressive farmers as they

belong to the same social and economic situation and come from the same area. They prefer to adopt improved agricultural practices through them rather than outsiders in the person of extension workers.

Much better results can be obtained if new ideas are introduced through the consent and support of such farmers.

XI

Extension workers should be professionally competent.

In order that the extension workers may perform skillfully the professional tasks before them, they need the following abilities.

1. Thorough knowledge of the subject matter.
2. Understanding the extension service.
3. Human relations.
4. The ability to plan.
5. The ability to organize people and things.
6. Relating principle and practice.
7. Counselling.
8. Working with local leaders.
9. Arranging learning situation.
10. Ability to communicate.
11. Evaluation of extension programmes.

XII

Human relations.

The cultivation of an atmosphere of understanding between the extension workers and the people is essential.

Understanding of the principles of human relations is the essential basis for effective analysis of behaviour and conduct of educational programmes—designed to foster more effective behaviour.

Realities of character essential for good human relations are sincerely personal integrity, humility, courtesy, wisdom, charity.

Human relations have to do with how people get along-with one another. Since their job is to bring about change-in people, extension workers have to discover how to get people to act in ways they want them to or else change their goals to those desired by people. One may know the technical answer, but unless he also knows how to work with people he would not know how to get technical answers translated into better farm practices.

Failure usually is related to ones 'inability to get along with people.

XIII

Competition as a means of motivation.

People are often spurred to adopt new ideas by the motivation of competition. This may be observed between individuals, between groups, and between villages. Competition may be thought of as a basic ingredient in the prestige motivation, since successful competition usually leads to greater prestige for the winner.

In developmental programmes the importance of competition generally has been recognized, and efforts have been made to to utilize this motivation in bringing change, for example, in crop competitions, cattle fairs youth club projects and so on.

XIV

Knowledge of success and failure.

The learner in a programme of adult education does not make much progress unless he knows in what respects he is succeeding and in what respects he is failing.

A knowledge of his successes and failures should result in a challenge to the learner rather than in discouraging him.

It is an accepted principle of educational psychology that reward is a more effective stimulus to learning than punishment.

Without a goal, there is no success to be satisfying or error to be annoying. Success in a motivated activity brings reward: failure brings annoyance.

Knowledge of results is necessary for an awareness of success and failure. It defines them, makes their consequences possible, necessitates the selection and elimination of the appropriate and the wrong responses, and helps determine where additional practice is needed.

Practice is futile in the absence of a knowledge of results in practice. Almost any device that furnishes the learner with a progressive knowledge of results in practice tends to promote his learning.

If improvement in performance is to be secured, it should be desired by the learner. Knowledge of results enable the learner to know whether he is 'right' or 'wrong' whether he is on the right track, whether he is improving. It makes a definite contribution to learning efficiency.

Short-term programmes in farm production may be taken so as to give quick results and impart confidence among the farmers and extension workers. If a farmer observes that he is becoming more effective in areas in which he desires to become proficient, he will be motivated by his own desires for self improvement.

The people learn best when there is some reward for learning, in terms of needs satisfied or a general feeling

of accomplishment. Things learned which produce satisfying action tend to be repeated. The farmer who obtains a larger yield of maize by planting hybrid is likely to continue this practice. Satisfaction from one learning experience stimulates interest in other improvements. It is frequently necessary for the extension worker to help the learner to see that he is moving toward the desired goal and to help him recognize and appreciate the progress that he is making.

XV

Learning must result in functional understanding.

Memorization alone is temporary unless reviewed or put to use in a practical situation. Activities that stimulate use situations are most effective. The content should be organized into meaningful units.

Understanding a thing consists largely in seeing why it is true. Nothing is really known unless it is understood. Ability to apply or use knowledge in new situations depend largely on how well it is understood.

Understanding is closely related to thinking, the seeing of relationships. Learners come to understand as a result of the thinking they do. Understanding of a truth comes from seeing its relation to other knowledge, particularly that which explains it.

Some teachers seem to be satisfied with a prescription, type of teaching—dealing only with what to do and how.

Useful learning requires that students not only acquire new facts and ideas, but also understand how to apply them in realistic situations. Subject—matter is useful only when it is understood and contributes to the attainment of a chosen-objective.

To gain a functional understanding of technology requires knowledge of the whole, recognition of the parts and ability to see distinctions among the parts of related knowledge. For example, to be successful in the use of fertilizer in his wheat field, a cultivator must not only know that it is a good practice, but also the formula and the amount to be applied and when and how to apply it. Learners, therefore, must identify the connection of ideas with each other and with the problems.

EXTENSION METHODS IN THE TRANSFER OF KNOWLEDGE

G.S. BAWEJA

In a predominantly Agrarian country like India, any attempt aiming at radical change in the socio-economic condition of masses must be directed towards rural communities. It is well known that a number of efforts were made in the past to achieve this objective, particularly by raising agricultural production. The outcome of these attempts was not quite encouraging and in some cases they spelt failure primarily due to faulty techniques and lack of problem oriented approach. After Independence the most important enterprise undertaken towards all-round rural development in India, is perhaps the Community Development Programme. It is a programme which aims at substantial improvement in all aspects of rural life. It emphasises adoption of improved agricultural practices, with a view to increasing agricultural production and the income of the farming community.

I. Role of Extension Education in Community Development.

The primary objective of Community Development and National Extension service is to help people in identifying problems develop solutions and provide reliable subject-matter plus information on the availability of needed supplies and services. The approach in Community Development Programme is to help people help themselves and this requires education. It is for this reason that extension has been recognised as an educational process. Education in any form defined, simply is production of changes in human behaviour. Thus extension is an educational process by which scientific and technical

knowledge is carried to and learnt by farmers. It is also, sometimes, referred to as 'out-of-school education, in which people learn by doing.

The principles of extension education are the same as that of any education but it has certain striking contrasts with the class-room teaching.

1. Whereas the class-room teaching starts with children, extension deals with youth and adults in actual life situations.
2. In case of class-room teaching, attendance in compulsory but participation is voluntary is extension education.
3. Class room teaching is formal and emphasises more on theory whereas extension education is informal and lays major stress on practical application.

It is, therefore, obvious that extension worker has to play the role of an educator and utilise educational process to bring about change in knowledge, skills and attitude of the farmer. Hence is it education for action and fruits of extension education are the changes in people reflected in their attitudes, actions and what they say and do.

It must be emphasised that Extension is a process of working with people, not for them, making them self-reliant and not dependent, making them central actors in the drama and not merely the passive spectators. It is only through educational process that villager's can be led to make substantial permanent improvement at the farm and home. Without primary emphasis on change through extension education, the rural developemnt programme would drift into a condition of physical or quantitative achievement. Recently while inaugurating a seminar in Delhi on the use of raido to educate the farmers on modern methods of agriculture, the Union Minister for Food & Agriculture Mr. Swaran Singh observed that

to increase agricultural production, developing countries would have to follow generally the same path as the advanced countries prior to their industrial revolutions have followed. They would have to educate their people as quickly as possible, and establish and extension seıvice which would continually carry to the farm the latest findings of the research laboratories.

It is recognised that in-spite of the clearly defined objectives, the newely started C.D. Programme soon began to handle a number of programmes for extension of knowledge, services and helping the rural people with a view to quicken the pace of development. With a diversified approach to meet manifold demands of the programme, the emphasis on educational aspects of extension was relegated to the background and as a result we became target-minded. In order that Extension plays its rightful role and to achieve lasting rasults, more and more emphasis should be laid on educational aspect of extension programme.

There is no denying that we have a vast store of knowledge and research work but even so, not much headway has been made in the living standard of the villagers. It is primarily due to the fact that the results of research have not been put across effectively to the cultivators and thus the rural economy remains stagnant. In this context, it would be appropriate to quote a statement by Dr. J.P Leagans, which reads, "It is not man's knowledge of Technology alone, but what he does with it, that is of transending importance."

II. What are the Extension Methods.

People in villages are like people anywhere else and they follow the traditional ways handed down from past. There aıe queer notions about their ways of living but it must be recognised that an Indian farmer is illiterate but

not idiot. He is cautious but not conservative. With proper approach and understanding, he is prepared to accept and adopt any new ideas and practices.

It is a common knowledge that people learn by seeing, hearing and doing. The Extension Worker has therefore to arrange situations through skilful use of Extension methods for the villagers to see, hear and do. Importing theoretical knowledge of facts and subject-matter is an easy task but getting people to understand, accept and apply new practices is rather difficult. In extension, greater emphasis has to be laid on doing because statistics reveal that people learn.

(*i*) 10 per cent of what they hear.
(*ii*) 20 per cent of what they see and hear.
(*iii*) 70 per cent of what they see, hear and do.

This is further supported by a Chinese proverb :

If I hear, I forget.
If I see, I remember.
If I do, I know.

A true Extension worker has therefore two-fold role to play :

(*i*) Dissemination of useful and practical information.
(*ii*) Practical application of such information.

Thus he has to educate the farmers and persuade them to adopt new and improved practices. For that he has to make use of a number of Extension methods to contact farmers and influence them to make changes in their mind and activities. Extension methods are tools of extension workers for approaching, working with and influencing the people to adopt new practices. These are the means by which participation of farmers is secured for implementing the programme. Thus they are means to an end. It is rightly said that extension methods are to

extension workers what tooks, machines, wrenches and hammers are to a mechanic. Before one becomes efficient in the use of extension methods, it is necessary to know them and when and how to use them under different situations.

III. Classification of Extension Methods.

In the execution of his assignment, the extension worker has to draw upon a number of extension methods : the judgement exercised in selecting the most appropriate method for a particular teaching situation and the skill with which it is used have a direct bearing on the amount and quality of achievement. The methods employed in extension work may be classified in several ways. According to use, extension methods may be classified into three groups depending upon the number and nature of contact involved. The three groups are:-

1. *Individual Methods:*
   (*i*) Farm visits.
   (*ii*) Home visits.
   (*iii*) Office calls.
   (*vi*) Correspondence.
   (*v*) Result demonstrations.

2. *Group methods:*
   (*i*) Group discussions.
   (*ii*) Meetings.
   (*iii*) Tours.
   (*iv*) Method demonstrations.
   (*v*) Leaders Meetings.
   (*vi*) Meetings on result demonstrations.
   (*vii*) Schools.
   (*viii*) Dramas.
   (*ix*) Puppet shows.
   (*x*) Bhajan Mandlies.

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3. *Mass Methods:*
   (*i*) Publications.
   (*ii*) News stories.
   (*iii*) Circular letters.
   (*iv*) Radios
   (*v*) Exhibitions.
   (*vi*) Posters.
   (*vii*) Films and film strips.

Extension methods may also be classified according to form :

1. *Written*
   (*i*) Bulletins.
   (*ii*) Leaflets.
   (*iii*) News articles.
   (*iv*) Letters.
   (*v*) Wall news paper.

2. *Spoken*
   (*i*) Meetings.
   (*ii*) Visits.
   (*iii*) Office calls.
   (*iv*) Telephone calls.
   (*v*) Radios.

3. *Objective or Visual.*
   (*i*) Result demonstrations.
   (*ii*) Exhibitions.
   (*iii*) Posters.
   (*iv*) Movies, etc.

Indirect Influence

Once an improved practice has been accepted through the use of variety of extension methods, passing on information from one neighbour to another neighbour as a result of a personal visit or otherwise is an important consideration in extension teaching. Those people try

the same practice and as a result of satisfaction achieved, they also adopt the same. They in turn pass it on to others. All this leads to attainment of the same objective as is done through the use of extension methods. Thus indirect method which is the sum total of all the extension methods, is quite important for extension workers.

Extension methods which fall into the three groups according to the use have relative merits.

1. INDIVIDUAL METHODS

Generally the methods which deal with people as individuals are useful and important for those who do not participate in extension activities and where the changes to be brought out are complex. Individual contacts also increase the confidence of farmer and help in first-hand knowledge of the villagers. They are useful in the selection of local leaders, cooperators and as such contribute to the group and mass methods. They are relatively more expensive than the other methods.

2. GROUP METHODS

They enable the extension workers to establish face to face contacts with a larger number of people and facilitate sharing of knowledge. They are adaptable to all types of subject-matter and diversity and interest of people. The group methods are less expensive than individual methods.

3. MASS METHODS

They enable the extension workers to approach larger number of people in shorter time. Though less effective than individual contacts, the number of persons contacted offsets the intensity and low effectiveness. Mass contacts reinforce individual and group contacts and contribute to the total accomplishment at a relatively lesser cost.

ELEMENT OF PROBLEM SOLVING IN EXTENSION PROGRAMME

J. E. Crosby & H.W. Butt

Extension exists because there are problems.

Extension has contiuned to assist in solving problems of people. This is in addition to the day to day responsibility of helping to improve the level of farming and home making for rural people. It is now recognized as one of the principal means of speeding up agricultural development throughout the world.

2. Extension is education for action and use now. Extension is concerned with real problems of rural people. The objective is to bring about change that is beneficial and desired. These changes relate to attitude, knowledge and skills as a part of making improvements.

Changes are not always welcome. It was only a few years ago in the U.S. that County Extension Agent was referred to as a book farmer. This inferred that he had no practical knowledge of farming and that without his book the Extension agent would be lost. This situation has changed because farmers have found it worthwhile to follow Extension recommendation. In some undeveloped areas people resist change as an infringement upon their way of life and resist with force. This is due to a misunderstanding of what Extension is trying to do. One can say that the secret weapon of Extension is truth. By dealing with facts and known solution, it is possible to overcome unfounded opposition.

3. From ancient times, the wheel has been recognized as a symbol of progress. For our discussion today involving the element of problem solving, let us use the

wheel for a graphic presentation of the subject. After-all we are interested in going places with our Extension cart. The following elements are to be considered:

(*a*) Farmer—To bring about desired results the farmer must change. This might involve either attitude, knowledge or skills or all of them. He undergoes a learning process which involves definite stages. In the first place he must notice something or become aware of the new idea. He must want something or feel the need of what the new idea can offer him. He must do something which involves action on his part to implement the new practice. Finally, he must get something which makes him satisfied that the effort expended has been worthwhile and he can recommend it to others.

Extension worker must recognize the farmer as a person of ability with a high degree of intelligence. He does not confuse illiteracy with lack of ability. The farmer is the person with the problem. The Extension worker recognizes problems as opportunities for good Extension work. Without problems Extension has no opportunity to demonstrate its value. It is necessary that we understand the farmers situation. In our planning we must start where he is.

(*b*) The Extension worker is a teacher. As a teacher he has two basic objectives—to prepare the learner and to present knowledge.

Extension teaching involves voluntary participation by the people served. This is in sharp contrast to the usual educational

processes where students attend class and take examination. Extension teaching usually involves giving up an old practice before taking on the new. This increases the need for effective subject matter and methodology in order to bring about the change.

Changing people involves a big responsibility. In the first place it must be beneficial and in the second place it must be permanent, if the good is to continue. In order for the Extension worker to perform the services required of him, some basic qualities have been identified. He must be well trained technically. He must like people and enjoy working with them. He must have good judgement and understanding. It is essential that he has the ability to recognize problems so that he can help the farmer develop a proper perspective of the problems. He must have confidence in his ability and competence to actually do the job.

In effect the Extension worker is a salesman. His product is better farming and home making which means a better way of life for the people be serves. His recommendations are backed by research and experience. With the best product in the world to sell and the backing of research and experience, the Extension worker is in an enviable position as a salesman.

(*c*) Subject matter is essential. This is the material out of which solutions to problems are made. It must be applicable to the specific problem at hand. It must be reliable so that the

demonstration will produce the expected results. This is why it is so important for the subject matter used by Extension people to have a solid base of research and experience.

Subject matter must be available when it is needed, where it is needed and in a usable form. This means that the research worker and the Extension worker have a joint responsibility for interpreting research results for Extension use.

As an example take fertilization as a subject about which Extension workers are faced with many questions. Farmers ask what kind of fertilizer, how much should be applied, when should it be applied, where should it be placed in relation to the plant roots and how is the proper way to place fertilizer. These are questions which require the attention of the research worker. A demonstration is not the place to produce new information. A demonstration can add to the amount of field experience and support research work.

(*d*) Methodology—Extension methods are the tools of teaching. When going into great detail methodology involves the processes of communication. Extension is connecting link between the research plot and the farmer's field. New information is carried to the farmer for application and problems of the farmer are carried to the research worker. This is why Extension communication is described as a two-way process. This is an essential part of changing the attitude, knowledge and skills which go along with learning process.

Subject matter and Extension methodology must go together. There is no point in debating which is of primary concern. Such discussion is as pointless as which comes first —the hen or the egg.

(*e*) Supply—This includes the materials, equipment, credit and other services required by a farmer in order to follow them with a recommended practice. It is the wherewithal for doing the job. Unless the requisites are available to the farmer he will not be able to follow the recommendations, no matter how much he wishes to do so.

Extension has a responsibility in making production requisites available. It is an additional responsibility relating to sources of supply such as letting farmers know that the required items can be obtained. In many places cooperatives are the source of supply. Extension should work closely with cooperatives so that they can function on a sound basis and be in position to serve. Requisites need to be available when needed, where needed, what kind and quality needed, at a reasonable cost. Extension should not attempt to provide the physical distribution. This should be left to either a cooperative or private business. The Extension worker should use his time and energy to do the job he is trained to do.

(*f*) Organization—This is a hub of our Extension wheel. Each of the elements do not just happen. The Extension worker whether he is a Village Level Worker or an Agricultural

Extension Officers are parts of an organization. Farmer is represented through Panchayat Raj. Subject matter is produced by a research organization. Methodology is the product of the teaching profession applied to Extension. Supply involves cooperatives, credit organizations and private business. All are inter-related. All are essential at some point. In considering the elements listed one might ask if there is a single problem of agricultural production that does not involve all elements at some point in some manner.

(g) Team work—The rim in a wheel makes it whole together. It determines what kind of load it can carry. It largely determines its wearing ability. In our Extension wheel team work produces strength. It takes the entire group working together as a team. One part alone cannot be effective in solving problems. For best results the entire package must be used. This applies to maize production in the U.S.A. or paddy production in Taiwan or Raghi production in Mysore State.

4. In conclusion better farming is in the public interest. From the stand point of the individual farmer it is a means of his becoming a more stable, self reliant citizen. He can contribute more to India's economic growth. Better farming means that India is required to divert its resources in making up deficiencies in agricultural production. Agriculture becomes a more potent foreign exchange earner for nation building.

Extension workers have a key role in the exciting and rewarding business of building people—the economy —and the nation.

PROGRAMME OUTLINE

The Extension programme should include a statement of :

1. The situation in which the people are located.

2. The problems that are part of the local situation. Also an analysis of these problems and priorities.

3. The objectives and goals of the local people in relation to these problems.

4. The recommendations or solutions to reach these objectives.

......On a long time basis (several years)

......On a short time basis (a year or less)

In addition to the above items, some extension programmes include a statement of the 'gap' between the existing conditions and the recommended solution as an indication of what is required to accomplish an objective.

DEVELOPING THE EXTENSION PROGRAMME

G.G. GIBSON & BHOJRAJ SINGH

The main purpose of the extension programme is to provide an orderly approach to tackling problems of a priority importance to local people so that full use is made of all available resources. The programming process provides a means of involving local people in all stages of programme building and implementation. The experience shows that when people have a voice in shaping the extension programme, they are more likely to be interested in its success. This is the best way to give a programme real meaning and purpose.

The programme cycle involves seven essential steps.

1. *Situation and analysis:* All subsequent steps are dependent upon the situation. In fact, the whole purpose of extension education is to permanently change selected elements of the situation such as farm returns, land use, family nutrition etc. Those involved in planning the local extension educational programmes need the best possible understanding of economic and cultural factors and the resources available for tackling problems.

2. *Organization for planning:* This means involving the people in the planning process. Involvement of people is a basic element of extension education. Participation helps to arouse interest, and those helping to determine a programme will usually do all they can to make it succeed. Involvement of people also results in better programmes.

As the programme develops, it is necessary to see that various groups and individuals are included. Since it is a problem to determine whom to involve in the programme planning process, the following steps are suggested as a general guide:

A. 1. Identify and counsel with :
   - (*a*) Existing leaders—both formal and informal.
   - (*b*) Cooperators in previous extension or related rural programmes if any; and
   - (*c*) Individual citizens having useful knowledge, understanding or interest.

2. Consult with other professional workers such as :
   - (*a*) Formal or informal planning Committees ;
   - (*b*) Tribal councils and other official bodies ;

(c) Commercial and cooperative organizations ;

(d) Administrators of programmes in related fields.

3. *Programme Planning Process :*

(i) Identify wants and needs. Rural people are ready to undertake which they believe will satisfy their wants although they may not be aware of all their basic needs.

(ii) Consultation with specialists and other technically trained people will point up the more basic needs and ways of satisfying these needs. It is the job of the extension worker to bring this technical information to the attention of rural people for their consideration. This may cause people to change their minds as to what they want, and provide a basis for a sounder programme more acceptable to the people.

Determine relative importance of various recognized needs and decide on priorities. This must be done in consultation with the people whose co-operation is required in conducting the programme.

(iii) Identify the problems involved in satisfying the needs given high priority.

(iv) Determine possible solutions of problems or alternative courses of action.

(v) Agree upon objectives. This is a joint function of extension workers and the rural people involved. In order to be of value, objectives must :

(a) Identify needs and wants ;

(b) Specify the specific behaviour changes to be sought.

(c) Identify the people involved, indicate the change to be made and the subject ma.ter to be used;

(*d*) Select those objectives that are practical in terms of staff, materials, and other available resources ;

(*e*) Meet the test of most of the criteria relating to................Is the proposed change at the top or near the top in the recognized needs of the people............Is it a change that is important to many............will local leadership give full support ....Have "Off-the-farm" hurdles to success been cared for............Is it practical and simple enough for people to adopt and carry out............ Is it practical and possible for professional staff to give adequate guidance............ Can it be used as a teaching medium for others ....Can the programme, where carried out, be used as an example of what extension can do..........Are the results readily observable and able to be accomplished within relatively short time.

(*vi*) Prepare statements of the objectives :

These are needed by the individuals and groups involving in determining the programme. They should be incorporated into a written programme and available for use in informing interested and concerned with programmes.

4. *Plan of programme:* Plan of programme may be recorded in written form and copies made available to all co-operating groups. This is necessary to avoid lot of misunderstanding as to what was agreed and to serve as a criteria for measurement of achievement.

A good written programme will normally contain;

(*i*) The names of persons to plan the work and the procedure followed.

(*ii*) The situation statement of needs, interest and identify problems.

(*iii*) Statement of agreed objectives.

(*iv*) Provision of co-ordinating with other groups, agencies and organizations.

5. *Plan of work:* This is a statement of activities to be undertaken by the individual, agency, or group, within a definitely stated time to carry out the recommendations indicated in the programme. The plan of work indicates: What is to be done, who is to do it......... how it is to be done,.........when it is to be done ....how is to be served or reached,......... How results might be measured.

6. *Execution of plan of work:* Programme action is the heart "of the extension education process". It is here that people learn improved skills, gain knowledge and to change their attitude.

The first requirement for successful programme action is sound technical knowledge on the part of the extension worker. The second is the use of extension teaching methods suited to the subject matter and to the people involved; for example the result demonstration is effective in showing an illiterate farmer how to use fertilizers to increase rice yield.

The value of advance planning of each programme activity cannot be over estimated. This includes making sure that all involved know their responsibilities and how to carry them out. This means the advance preparation of teaching aids, checking on supplies of equipment to ensure their availability well in advance of the time they are needed and special efforts to make each activity a useful learning experience for all participants.

It is usually easy to find a few individuals in a community who will change their practice under close supervision and guidance of extension worker. The real test of an extension programme is to what extent and how much improved practices and skills and attitudes are adopted by the masses of rural people. Extension education as a broad public service cannot be justified on the basis of its value to 5 to 10 per cent of the country's population. Every appropriate means of reaching people must be employed.

The great challenge to extension educators is to find and develop channels of communication to reach the masses of rural people with a practical educational programme and to do it within the resources available for this purpose.

7. *Appraisal of accomplishments:* Periodic evaluation in terms of objectives of the programme provides a basis for continuous improvement. Plans for evaluation need to be included in the plan of work. This may involve the description of the situation existed at a given time, the record of changes proposed and accomplished, and the periodic description of the situation as it changes with time. Educational methods may also be evaluated to determine their individual and collective influence in inducing change.

The results of such evaluations are useful only as they are used in planning future programmes.

In the application of the seven steps in the extension programming process, it should be remembered that while these steps are considered to be distinct, they are not exclusive. In any dynamic on--going programmes there could be concurrent action on two or more steps.

For example, situation analysis and appraisal of accomplishment may be taking place along with the execution of activities within the plan of work.

In the final analysis, the programme provides the purpose for which an institution exists. This means that the effectiveness of extension education is determined to a considerable degree by the manner in which the steps in the programming cycle are followed and people are involved.

A STUDY OF VILLAGE PUJAM

(for Planning Extension Programme)

by

(Study Group no. 1).

1. Dr. G.S. Lawania
2. Dr. J.C. Sharma
3. Shri N.C. Jain
4. Shri H.P.S. Arya
5. Shri B.S. Kushwaha
6. Dr. A.N.P. Sinha
7. Dr. G. Trivadi
8. Shri Himmat Singh.

Programme

SITUATION

Location : Village Pujam is situated at a distance of 2 km from Extension Education Institute, Nilokheri on Karsa Road. The village is connected by a Kacha road and can be easily approached by bicycle or light vehicle. In this village, farming on appreciable scale has been taken up, only about 15 years ago.

Population : There are 72 families comprising of 365 persons. Out of 72 families only 16 are owner-cultivators, 12 crop sharers and 44 earn their living either through, agricultural labour or through other occupations.

Land : The total area of the village is 900 acres out of which 634 acres is cultivated and only 335 acres is double cropped. The soil is loam. Patches of alkalinity are developing in the village and about one tenth of the cultivated area have become alkaline.

Irrigation and Drainage :—The average rainfall of the area ranges from 30 to 40 inches. Canal, surface well and tube-wells are sources of irrigation. The canals supply

water in rainy season only for about 334 acres. Thus there is lack of proper irrigation facility for Rabi crops. There is only one small tube-well in the village.

In rainy season there is flooding in fields around the village. The Railway line running along the village, a cannal distributory passing through the village land have checked the free flow of water, thus have created land areas with no outlet. The village has two tanks, one for fishing and the other for draining the water of the village.

Crops : The main crops of the village are Paddy, wheat, sugarcane and berseem. Paddy—wheat & paddy—berseem are the common rotations. The average yield of wheat is very poor *i.e.*, approximately 5-6 mds. per acre.

Institutions, services & supplies : The village has its own panchayat, Primary school and a Service Cooperative for supplying necessary credit and agricultural supplies. So far there is no youth club and women club in the village.

PROBLEMS

1. *Drainage :* As a local informer puts it, water is their main problem, too much during rainy and autumn seasons and too little during spring, and summer. Due to existence of railway line and canal banks, natural outflow of rain-water within the area is blocked. Nearly one-third of the cultivated area remains submerged in rain-water during monsoons and autumn and presents the appearance of a pool. Water table rises almost upto the ground level and imposes a severe restriction on the choice of crops that may be possible grown. Appreciable area under paddy is the outcome of this problem. Even Rabi sowings have to be restricted because the soil remains

moist and sticky for long. Soil borings also helped to reveal that sub-soil drainage is worsening. During winter, the water table drops down to about six feet and there is no water supply from canals for irrigation.

2. *Salinity* : Almost equally grave is the closely connected problem of salinity. Nearly a tenth of the cultivable area has been abandoned and blank patches in growing crops were noticeable owing to salinity. The kind of salts involved the pH value in the area have not yet been determined.

The informant villagers estimated that nearly two-thirds of the cultivated area in the village will have to be abandoned within the next 15-20 years if the twin problem of water logging & salinity was not solved.

3. *Soil fertility* : With nearly 210 animals and 634 acres of cropped area, hardly half cartload of cow-dung per acre is available as manure because a substantial part of the total cow-dung produced is burnt for domestic use. Neither other forms of organic manures nor fertilizers are used to any appreciable extent. Although no nutrient analysis of the soil has been made, a physical examination revealed that fertility is generally quite poor.

4. *Poorly levelled fields* : Coupled with the first two problems, lack of sufficient care in proper levelling of individual fields leads to uneven and poor stand of crops. This problem, however, was not serious.

5. *Others* : Shortage of irrigation wells, absence of canal water supply from October to June when it is most needed, lack of improved seeds, credit other supplies, and technical advice are some of the other problems pointed out by the village informants.

PLAN OF WORK

As an illustration, an outline of plan of work for dealing with the problem of salinity was prepared by all the participants in the seminar. For limitations of time, the Group (No 1) worked out the plan of work in terms of only one of the various alternative solutions listed by the group to only *one* of the problems described above. The problem chosen to be dealt with was that of drainage.

OBJECTIVE

In dealing with the problem of drainage, the objective is :

To improve the drainage so as to make the soil of Pujam village fit for normal cropping.

POSSIBLE SOLUTIONS

1. Laying out drainage channels (kachha open drains).
2. Siphoning (pumping out) accumulated water into the canal or an intervillage drain.
3. Installing sub-soil drains (*e.g.* tile drains).
4. Constructing an outlet accross railwayline and/or canal banks.
5. Sinking additional wells.
6. Growing crops with high water requirement.
7. Proper levelling of fields.

If a prompt coordinated approach is feasible on the part of various government departments, a combination of the solutions listed above would be the fastest way of solving the problem. Since feasibility and prompt relief are important, immediate efforts are needed to be focused on a combination of the first two proposed solutions, as a matter of priority. The plan of work for achieving the objective in line with the two proposed solutions is as follows.

PLAN OF WORK

This plan of work is intended to be only a guide for the Extension workers connected with the village for inviting detailed programme planning and for the procedure to be followed. The actual plan of work will have to be evolved by them in collaboration with the local people, their leaders, and connected government personnel. This will imply a much wider and deeper contact with them than was possible for this group.

PLAN OF WORK

What is to be done (1)	*How it is to be done* (2)	*Who* (3)	*When* (4)
1. Procure, if already available or prepare, after survey, a contour map of the area so that low-lying areas can be located precisely.		Overseer of Nilokheri Block	20-2-64
2. Procure the shajra number (land ownership) map of the area from Patwari if not already available at the block headquarters.		Gramsevak	20-2-64
3. Determine on whose fields the low-lying areas fall.	By studying the two maps.	Overseer, Gramsevak AEO., Instructor in Agriculture.	15-2-64
4. Determine pH, Value moisture content of soil, and water table in the area.	By observation, taking soil samples and analysing them.	AEO, Gramsevak, Instructor in Agriculture.	28-2-64
5. Prepare layout for plans for drains for the entire area.	On a map, taking into account the contour.	Overseer, Gramsevak and Instructor in Agriculture.	2-3-64
6. Prepare plan for locating pumping sets in areas where maximum accumulation of drained water is likely.		Overseer, Gramsevak and Instructor in Agriculture.	2-3-64
7. Estimate and cost of laying out drains and installing pumping sets.		—do—	—do—

(1)	(2)	(3)	(4)
8. Ascertain if surface drainage system is in operation within an easily approachable distance from Nilokheri.	By personal inquiry from local and state officials concerned with the problem.	Principal, EEI., Nilokheri.	15-3-64
9. Prepare tentative plan for visit of the concerned Extension workers and local villagers to the area selected under Step 8 on two separate days.		Overseer, Gramsevak, Instructor in Agri. and B.D.O.	22-3-64
10. Overseers, Gramsevak and B.D.O. visit the selected areas, observe the drainage system in operation and plan to the villagers.		—do—	23-3-64
11. Discuss with villagers the proposal for their visit to the area and work out plans of their transportation etc. Also involving Panchayats.		AEO, VLW, Instructor in Agriculture.	23-3-64
12. Put to action what was planned under Step 11.		AEO, VLW, Instructor in Agriculture.	28-3-64
13. If a drainage system in operation is not possible to be visited as proposed in the preceding 5 Steps, find out or prepare suitable visuals so as to depict the utility of drainage system convincingly. For example, a model showing fields and drains with running water can be prepared locally on a miniature scale out of soil in the village itself. Visuals can also be used to supplement the usefulness		AEO, Instructor in Agriculture and Visual Aid Specialist of the EEI, Nilokheri.	28-3-64

(1)	(3)	(3)	(4)
of the proposed visit if the later does materialise. Put the Step into action.			
14. Arrange a meeting to have follow-up discussions with all the villagers if possible or atleast with the land owners involved in the problem. Panchayat should also be involved.		Overseer, AEO, Instructor in Agriculture, VLW, BDO, if possible DAO and Principal EEI, also.	—do— or the following day and
15. At the meeting in Step 14 prepare the actual plan of work. Decide the precise steps to construct the drains and culverts (may be substituted by concrete pipe) and also for installing pumping sets. Decide exact locations, access financial requirements and possible construction by local effort of the people and Panchayat and also the expenditure of Government Financial Assistance.		—do—	—do—
16. Explore, at this meeting the possibility of levelling individual fields by improved or local scrapper within this year. If not possible this may have to be postponed to next year.		—do—	—do—
17. Implement decisions taken at the meeting and put steps 14-16 into action. Distribute work as decided.		Local leaders, Panchayat Officials, under supervision of VLW and occasionally all other staff involved also.	Before wheat harvesting as much as possible to be completed before.

(1)	(2)	(3)	(4)
18. Decide steps for maintenance and proper functioning of drainage and pumping sets, that is distilling and ridging etc. at the same of the meeting as in Step 14. Decide who will keep a constant vigilance, to whom to report and who is to take what action.		Participants of the meeting.	Before wheat harvesting as much as possible to be completed before monsoon in 9641.
19. Proceed according to plan prepared in Step 18.		—do—	Promptly as and when required.
20. At the meeting in Step 14, also prepare plan for evaluation of the project. The following things need to be determined: (*a*) How much area has been covered (*b*) Did we proceed according to schedule. (*c*) Periodical soil analysis to determine changes in structure, pH and moisture content (*d*) Study effect on water table (*e*) Observe change in: (*i*) Natural vegetation (*ii*) Growth on crops (*iii*) Area under crops specially Kharif (*iv*) Yields per acre. (*f*) Expenditure incurred direct and otherwise. (*g*) Financial worth of the gains derived.			
21. Record success—talks on tape, photographs etc. to serve as publicity/educational material expansion of this kind of work.		E.E.I., and Block Staff.	During and after step 20.

(1)	(2)	(3)	(4)
22. Fix schedule for another meeting for review, reconsideration and for preparing future plan of work.		AEO, VLW, Instructor in Agriculture (preferably BDO also).	Soon after evaluation.

FIELD TRIP

Visit to Village Jhanjari.

The purpose of visiting village Jhanjari was to sharpen techniques of problem identification through field observations and discussion with village leaders and other progressive farmers. The participants were also equipped with all the information regarding the village. Some of the main features of the village are given below.

Location. The village is situated at a distance of 7½ miles from Nilokheri on the left side of the G.T. Road towards Karnal.

Climate. The climate of this village is tropical in nature. It is accompanied by hot winds during Summer and spell of cold winds during Winter. The average annual rainfall ranges from 30″ to 35″.

Physical features of land. The land is a plain. The soil can broadly be classified into 4 groups *viz.*, (*i*) Clayey, (*ii*) Clayey loam, (*iii*) Loam, (*iv*) Alkaline soils.

Population. The total population of the village comes to 645 comprising of 240 males, 204 females and 201 children.

Settlement Pattern. The layout of the village is square in form and well planned. Main kachha road which runs alround the village is about 20 feet wide. The land of this village has been consolidated and is owned by the cultivators and they pay land revenue to the government.

Cropping Pattern. The main crops grown in Kharif season are Paddy, Maize, Cotton, Jowar, Urd, Sugarcane and Vegetables like Cucurbits. The Rabi crops are Wheat, Barley, Gram, Berseem, Potato and Onion.

Area under Cultivation. The total area under cultivation is 620 acres out of which about 400 acres is irrigated.

Irrigational Facilities. The main source of irrigation is a canal but tubewells and other minor irrigation wells are also there.

Rural Institutions. There is a Primary School, Panchayat, 2 Cooperative Societies and a Youth Club.

Problems of the Village.

(*a*) Drainage and alkalinity.

(*b*) People don't use preventive measures against pests and diseases.

(*c*) Lack of knowledge of soil productivity and in sufficient use of organic as well as inorganic manures.

Participants Observations.

The questionnaire attached was also made use of while visiting the fields, soils, crops, water and farmers. More emphasis was laid on soil productivity.

The 3 pits on various spots of the size of 6ft. in length, 4 ft. in width and 4 ft. deep were studied and certain conclusions were drawn in respect of condition of surface and sub-surface soil, its colour, structure, presence of different elements like iron, etc.

After a complete survey of the village area, study of 3 pits and a discussion with villagers, the participants came to a conclusion about the problem of the village which needs attention.

Review of problem noted on the Visit to village Jhanjari

The visit to the village was to recognize the problem first hand and to be sure what problems actually exist. The real situations make for the best training aids and gives the definite relationships of each problem or part to the whole.

To train the class members in soil characteristics actual pits were dug. These pits 4 feet wide, 6 feet long and 4 feet deep with the 6 feet length facing the sun were examined by the class.

The following observations were made:—

1. The depth of ploughing & condition of the surface soil.
2. The colour of the soil at various depth.
3. The presence of iron concretions in various sizes and numbers.
4. The structure of various layers and the direction and size of cracks in the dried portions.
5. The presence of roots throughout the pit.
6. Salinity on the surface as indicated—by the salt which was visible.

Of the three pits examined definite differences were observed. Having observed these deficiencies it was shown how they could learn to determine various soil characteristics with the use of a soil auger. Observations were made of the crops, their condition, density of stand, rate and uniformity of growth and indications of nutrient deficiency by colour of leaves. The temperature having been low many colours appeared which could not be definitely attributed to nutrient deficiency.

Following the prepared form for use during the visit other observations were made such as the tilth, uniform application of water, weeds etc.

These observations along with information collected from the cultivators made it possible to determine the most serious problems of soil productivity and to give a basis for the development of a plan for an extension programme with the village.

HOW EFFECTIVE ARE THE DIFFERENT EXTENSION METHODS

KHUSHI RAM

Introduction

Many extension teaching methods are available and according to the number of people reached, they can be classified into three major groups; mass media, group methods and individual contacts. Each of these teaching devices has its own merit, each of them supplement one another. It may be necessary to use several of them in succession in order to achieve a desired result.

The fundamental objective of extension work is the development of people. For this, extension workers are needed who can understand the educational process and are able to use the different extension methods effectively. People are influenced to make changes in their behaviour in direct proportion to their exposure to the extension teaching methods used.

Relative effectiveness of different extension methods.

When I was attending the FAO-sponsored Regional Training Course for Extension Trainers, held at Los Banos, Philippines, in 1958, I had occasion to discuss the question of the relative effectiveness of different extension methods with Prof. Lincoln David Kelsey, co-author of the book "Cooperative Extension Work". He encouraged me to make a study on this subject when I returned to Nilokheri, India, to compare with a similar study in U.S.A. which was reported in his book. This I did in the Nilokheri Community Development Block. It was anticipated that there would be some differences, as shown in Table I, between these two studies as conditions in the two countries are very different.

TABLE 1: **Relative Effectiveness of Different Extension Methods in U.S.A. and India (the Nilokheri Development Block).**

Extension Teaching Methods.	*in percentage* U.S.A.	India.
1. Indirect influence	19.1	10.85
2. Methods that reach masses: News Stories, Circular letters, Radio, Exhibits, Bulletins, Posters.	37.4	32.95
3. Methods that reach groups: General meetings, Method demonstration meetings, Leader training meetings, Extension schools, Study courses.	26.0	26.73
4. Methods that reach Individuals: Demonstrations, Farm and home visits, Office calls, Correspondence, Telephone calls.	17.5	29.47
	100	100

In extension work, one should try to reach as many people as possible. In a country, like the U.S.A., where literacy is high, the mass media methods, which are least expensive, are most useful. But in India, where the situation is different, individual contacts are most effective. Of course, they are most expensive.

The details of our study in India are shown in Table II below.

TABLE II: A study of relative effectiveness of different Extension Methods in Nilokheri, India.

1.	Indirect influence		10.85
2.	Methods that reach masses		
	News stories	2.58	
	Radio	12.57	
	Exhibits	13.00	
	Bulletins	1.60	
	Posters	3.20	32.95
3.	Methods that reach groups		
	General meetings	9.50	
	Method demonstration meetings	14.80	
	Leader training meetings	1.72	
	Study courses	0.71	26.73
4.	Methods that reach individuals		
	Demonstrations	14.30	
	Farm and home visits	13.57	
	Office calls	1.48	
	Correspondence	·012	29.47
		TOTAL	100

This study clearly shows that farm and home visits, demonstrations, method demonstration, meetings, general meetings exhibition, and radio are very important extension teaching tools in influencing people to adopt new practices. They together account for about 77 per cent of changes. Indirect influence—neighbour to neighbour talking and seeing—accounts for about 11 per cent of the total influence. Indirect spread of improved seeds, implements and practices from one person to another shows an effect of satisfaction and confidence. But to do a good job of extension teaching requires the use of all these methods.

For instance, a personal contact is made through an office call or a farm visit. Thus a leader is visited or a demonstration is planned. Then a meeting is held to discuss the demonstration. The meeting can be advertised through circular letters. A news story can be written on the results of the demonstration. These happenings and results can then be broadcast over the radio. Pictures can be taken and a 'Slide Story' can be shown at a meeting. One method leads to another, and many of the methods are used in combination to repeat the same story.

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LAYING OUT RESULT DEMONSTRATIONS.

BADRI SINGH and R.D. KAUSHIK

The participants of the Seminar after visit to the villages and discussion with the cultivators could identify that the problem of the area is lack of adequate drainage facilities and formation of alkali. While formulating plan of work for solving the problem it was decided that as interim measure, sugarcane crop will be suitable and economical for cultivation in such soils. To demonstrate proper technique of cultivation of sugarcane, it was decided to arrange for a composite demonstration whereby cultivators can see every step in its cultivation.

The staff of the Institute gave an idea and trained the participants to conduct a practical demonstration to the villagers on the farmer's Field Day. The following objectives were kept in view.

1. To provide an opportunity to the participants of the work Seminar and present the demonstration before the farmers.
2. To show to the cultivators the recommended way of planting sugarcane.
3. To show to the farmers the advantages of the adoption of intensive and improved method of sugarcane, cultivation in the form of higher yields and profits.

Detailed break down of the Demonstration. The following practices have been included in the demonstration:-

Practice	Local	Improved
I. Method of Planting.	(a) One foot distance from row to row.	(a) Two to 3 ft. distance from row to row.
	(b) Furrow System.	(b) Furrow System. Followed by earthing.
	(c) Single set to set.	(c) 1½ set to set.
II. Seed treatment	No treatment	Aretan
III. Soil treatment.	No treatment.	BHC 10%
IV. Fertilizer application	60 lb. Nitrogen per acre (40 lb. through compost and 20 lbs through C.A.N.)	125 lbs. of Nitrogen per acre 25 lbs. Nitrogen per acre through compost. 50 lbs. Nitrogen from C.A.N and 40 lbs. P2 O5 from Superphosphate at sowing. 50 lbs Nitrogen at break of Monsoon
V. Seed (Variety)	Co 312	Co J 46
VI. Weedicide	Nil	Pre-emergence spray of 2,4. D @ 2 lbs. per acre.

The demonstration was rehearsed by the participants and ultimately laid it out before the farmers on the farmers field day successfully.

The farmers of the five villages attached to the Institute were impressed with the method and new variety of the sugarcane and were ready to get a demonstration laid out in their villages. It was at this instance that the Institute have now taken up result demonstration on sugarcane in five villages which have been laid out during the month of March, 1964.

A brief note on technique of conducting result demonstration is attached.

A brief note on technique of conducting result Demonstration.

Definition.—It is a method of teaching designed to show by example the practical application of an established fact or group of facts and thus proves the desirability of adopting new practice.

Objective : The primary objective is to furnish local proof of desirability of a practice and thus creating confidence among the people and the worker in the practice. The secondary objective is to create confidence of the people in the Extension Worker.

Steps to follow in conducting a result demonstration.

Demonstration.

The following are the suggestive steps for a successful demonstration.

I. Planning the Demonstration. While planning, the following points should be kept in mind:-

1. Define your objectives clearly.
2. List out participants whom you are going to involve in demonstration.
3. Draw up plan on paper.
4. Local supplies and materials.
5. Plan kind of record to be taken.

II. Select the Demonstrator (Farmer) : The demonstrator must be a dependable farmer. He must be trusted and respected and liked by the people of the Community. He must have adequate resources and facilities to carry the demonstration to a successful conclusion. His land on which the demonstration will be conducted should be near a road or path so that many people can see. The soil, water and other conditions should be typical of the area. The demonstrator should not be the *best*, nor the *worst*.

III. Make detailed plan with Farmer. The farmer should understand the purpose of demonstration. He should know his role in the demonstration that he is to keep the record and people will be visiting his field. He should also understand extension workers role in the

demonstrations. He should understand how each step in the demonstration is to be made and he should also understand why.

IV. Start the Demonstration. After the detailed plan is completed, the demonstration layout should be taken up. The presence of extension worker is essential. He should work with the farmer and his neighbours to set up the demonstration using the farmer's equipment etc. All work should be done according to plan. Check plots should be left for comparison and sign boards fixed for identification.

V. Regular Supervisory Visits. Periodic visits to the demonstration plot will maintain demonstrator's interest and will assure that the project proceeds according to plan. Regular visits will help to keep accurate records. A proper schedule for regular visits should find a place in the written plan. The visits would provide an opportunity for the agent to maintain good professional relationships with the farmers.

VI. Keep accurate records. Through out the project, keep accurate records of dates, what you did, observations and results. The records are of increasing importance as the demonstration progresses. At the conclusion of the demonstration, the summarized records will help show the value of the practice. They will also be the basis for comparisons between the recommended practice and local. An idea of costs involved can be had from the records.

VII. Follow up the demonstration. It is very essential that the farmers of the village learn about the results and appreciate the possible advantages of the practice. Thus meetings and visits should be planned to show people the results obtained.

In publicizing results, the emphasis should be on reduced costs or increased profits, increased yields or production and saving of time and energy.

VIII. Evaluation of Results. It should give the following information.

1. Did the demonstration show that the practice demonstrated had enough advantages over the old practice to justify its adoption?
2. Approximate number of people who saw the demonstration.
3. How many people have indicated that they plan to use new practice?
4. Should the demonstration be repeated again next year?

IX. Utilize results. The use of results should be made in reports, news items and articles.

X. Proforma of Written Plan.

1. Topic.
2. Objective.
3. Location.
4. Design.
5. Participants.
6. Equipment and materials needed.
7. Extension Education methods to be used.
8. Visits to be made.
9. Publicity to be made.
10. Evaluation.
11. Follow up programme.
12. Meetings to be held.
13. Records to be kept.
14. Details of operations to be done during demonstration.

PROGRAMME FOR KHAJA AHMEDPUR

(with emphasis on soil productivity)

I. Present situation with respect to soil productivity :

(*a*) *General information of the village* : Khaja Ahmedpur village is situated on the Nilokheri-Karsa road at the distance of two miles from the Institute towards the west. The village is situated in Nilokheri Block, which is a post-stage II block.

(*b*) *Population*: The population of the village is 389 having 75 families. Out of all the families only 36 are owning land.

(*i*) *Co-operative :* The name of the society is Service Co-operative Society. This Society has 19 members. It is doing the work of advancing credit to the members. It has already given credit worth Rs. 4000 to the members at present. The Society was started two years ago and it is doing only limited work of giving credit. It is worth encouraging it to satisfy the other needs of the members.

(*ii*) *Primary School* : There is one primary school with the strength of 65 students and one teacher. For high school education boys go to Nilokheri.

There are no other associated organisations like Youth Clubs, Farmers Club and Mahila Mandals.

AGRICULTURE

Crops: The total area of this village is 861 acres. The crop-wise distribution of this area is as under: Paddy 413 acres, wheat 110 acres, wheat and gram 188 acres, berseem 25 acres, sugarcane 20 acres and

Bajra and maize are grown on less than 10 acres. The yield of these crops per acre is as follows:

Paddy	20 mds.
Wheat	15 ,,
Wheat & Gram	13 ,,
Berseem	300 ,, (green)
Sugarcane	25 ,,(gur)
Bajra & Maize	it is extremely low.

The yield of the above crops is very low as compared with the average yield in the country. The yields stated above are decreasing every year due to salinity.

Soil :-The soil of this village is of loam type. About 53 acres is waste land which can be brought under cultivation. About 200 acres are badly affected by salinity. The effect of salinity is so much in some fields that they are kept barren since many years and in some of the fields there are big patches where the seeds do not germinate at all. Even the growth of the crops is very poor and water stagnates specially in monsoon.

Irrigation :-A branch of Sarasa canal passes near the village by which 334 acres are irrigated only in monsoon. The canal is not supplying water during winter and summer. 75 acres are irrigated by well. The bed level of the canal is above the field level and as a result there is a great seapage of water and it has resulted into increase in salinity and water table has also become very high. 75 acres are irrigated by well with pumps and 70 acres are irrigated by tube-wells. The water level in the well is at the depth of 5-6 feet and it is available throughout the year. The areas sown more than once by the help of irrigation facilities is 269 acres. There are 124 acres where irrigation facilities of any kind are not available.

During monsoon water cannot find any outlet and as a result it stagnates for 4 months submerging about 300 acres.

Improved practices in Agriculture : There are 65 compost pits in the village. They apply manure or compost to only sugar-cane and selected wheat plots. An average farmer who has 10 acres of land uses about 3 maunds of organic manure per acre per year. The area under green manuring is 10 acres. The total nitrogenous fertilizers used by the villagers in the previous year amounts to 36 Cwt. and phosphotic fertilizers to 6 Cwt. All the farmers use improved variety of seeds for paddy and sugar-cane. The improved varieties for wheat, sugar-cane and paddy are being used by most of the cultivators.

There is one tractor, 20 soil turning ploughs, 36 chaffcutters and 36 hand shoes.

ANIMAL HUSBANDRY

There is one stud bull in the village. The number of the cows in the village is 96 and the number of bullocks 158. The farmers grow berseem and jowar under 82 acres for fodder purposes.

MARKETING

The nearest market places are Taraori and Nilokheri. The farmers sell their sugar-cane produce to the Sugar-cane Collection Centre of the factory where price is fixed by the Government. This sugarcane collection centre is 5 miles away from the village. Other Agricultural products are purchased by traders and the price is fixed by mutual understanding. The price of the products in the harvest season is usually very low whereas in the off-seasons it is more than double.

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II. Problems with respect to soil productivity:

(*i*) *Salinity :* The farmers estimate that this problem if solved would increase the income over rupees 50,000 per year.

(*ii*) *Drainage :* The drainage capacity of the soil is very poor because of poor surface and sub-surface drainage.

(*iii*) *Water :* The canal water is available for irrigation only during monsoon. The farmers cannot dig tubewells for the irrigation purposes because of the lack of credit and power facilities. The main problem is to increase the area under irrigation during winter and summer by creating additional irrigation facilities, like wells and tube-wells.

(*iv*) *Fertility :* Soil test indicates the need for the application of balanced fertilizers including organic manure.

(*v*) *Seed supplies :* Though the farmers use improved seeds there is the problem of getting disease resistant varieties for wheat and sugarcane. There is no problem of supply on credit.

(*vi*) *Credit :* Credit facilities are existing only for fertilizers and to some extent for irrigation and orchards. The needs for credit exists for the equipment, bullocks and other needs of the cultivators.

III. Solutions :

Long term solutions :

(*a*) To build up drainage, canals.

(*b*) To make provision for Gobar gas plant.

Short-term solutions :

(*i*) To grow deep rooted crops like sugarcane in soils affected by salinity.

(*ii*) To increase the area under green manure crops to reduce salinity.

(*iii*) To increase the organic matter content of the soil by the use of compost and water.

(*iv*) To harvest paddy and wheat crops one foot above the ground and plough down the lower part in soil.

(*v*) To procure disease resistant improved seeds of wheat, paddy and sugar-cane.

(*vi*) To increase the membership of the Service Co-operative Society and to increase the business of the same.

(*vii*) Level the surface soil.

PLAN OF WORK FOR SOIL PRODUCTIVITY OF KHAWAJA AHMEDPUR.

Practice	No. of cultivators	Stage of adoption	How to do	When to do	Responsibilities of	Supplies	Evaluation	Remarks
To grow sugar cane.	For Demonstration	Interest.	1. Personal contacts.	1st week of Feb.	VLW.	1. Sugar cane seed will be supplied by the block on payment.	1. Soil test for PH.	
	1· Rati Ram		2. Film show.	2nd week of Feb.	VLW.& Projectionist.		2. Visual observation of stand of crop.	
			3. Talk by Expert & discussion.	3rd week of Feb.	Agri. Exten. Officer.	2. Fertilizers, insecticides and other chemicals will be arranged by the cooperative society.		
	2. Babu Ram		4. Supply of literature.	4th week of Feb.	VLW.		3. Comparing Economics.	
	For teaching. Other 30 farmers.	Awareness.	5. Layout of Result Demonstration.	1st week of March.	1. VLW. 2. Extn. Officer. 3. Farmer.	3. VLW. will assure that the Block and cooperative society arrange for the supplies in time.	4. Interviewing a few farmers to note their views.	
			6. Visits of the farmers to Demonstration Plots.	1. 1st week of March. 2. In July· 3. In October. 4. In December at Harvest.	VLW. VLW. VLW. VLW & Agri. Extn. Officer.		5. Record data of Final Harvest.	
			7. Regular Farm Visits.	Once in every week.	VLW.		6. How many farmers are willing to take it up next year.	

Practice.	No. of cultivators	Stage of adoption	How to do	When to do	Responsibilities of	Supplies	Evaluation	Remarks
II. Growing of green manure crop.	For Demonstration. 1. Ghasita Ram. 2. Ram Lekha.	Interest.	1. Group discussion of Farmers with VLW.	1st week of June.	VLW.	1. Fertilizers and seed will be arranged by the Cooperative Society. 2. VLW. will make sure its timely supply. 3. Superphosphate has to be used before sowing of green manure crop.	1. Soil test a. P.H.value b. Organic matter. c. Other nutrients. 2. Condition of the soil by visual observation. 3. Stand of *rabi* crop. 4. Yield of *rabi* crops. 5. Views of the farmers who observed the demonstration. 6. How many farmers are willing to take it up next year.	
	For teaching. About 40 farmers.	Awareness.	2. Film Show.	2nd week of June.	VLW & Projectionist.			
			3. Literature, in local language.	3rd week of June.	VLW			
			4. Talk of Progressive farmer who does it.	4th week of June.	BDO will arrange.			
			5. Layout of Result Demonstration.	1st week of July.	1. VLW. 2. Agri. Extension Officer. 3. Farmer.			
			6. Regular Farm Visits.	Once in every week.	VLW.			
			7. Visit of farmers to Demonstration plot.	1. Sowing time *i.e.* in July. 2. 2nd week of August. 3. 1st week of Sept. when burrying the crop.	VLW. ,, VLW.			

Practice.	No. of cultivators	Stage of adoption	How to do	When to do	Responsibilities of	Supplies	Evaluation	Remarks
				4. In February & March when wheat crop is standing.	VLW.			
				5. Harvest of wheat.	V.L.W.& B.D.O.			

VILLAGE AGRICULTURAL PRODUCTION PLAN

PUJAM

Introduction :

The village Pujam is situated two Km to the North-West of the Extension Education Institute Nilokheri. The village is on high ground getting lower on its outer periphery.

The Panchayat.

The village has a panchayat. Shri Man Singh is the Sarpanch. The members are Serveshri Chamel Singh, Sher Singh, Narain Singh, Shishu Ram and Smt. Bhakti Devi. In addition, there is a service cooperative.

Population.

There are 72 families with 365 persons. 16 families are land owning, 12 share croppers, and 25 engaged as agricultural labour. The rest are traders, cobblers or artisans or are engaged in services not connected with agriculture. There are two farmers who own 120 acres each, the majority of them own 10 acres and less.

There is no post office. There is a Primary School. The village has a good panchayat ghar.

Soils.

The total area of the village is 900 acres, out of which about 634 acres are under cultivation with 60 pairs of bullocks.

Roughly 10% of the cultivated area is saline and alkaline. These are found in small patches in large number of fields.

The soils are of the deep alluvial type. Study of the soil profiles from the relatively high lying areas immediately surrounding the village site, through the mid-zone to the areas at the periphery, indicate the following ;

High areas.

Uniform, friable alluvial loams to a depth of more than 4 feet.

Middle areas.

Friable and loamy to a depth of 2½ feet with a hard structure full of salinity-about 3 to 4 inches thick.

Peripheral zone.

Saline and alkaline patches on the surface of the soil.

Crops.

The cropping pattern is simple. Most of the cultivated area is under improved varieties of crops.

Crop	*Recommended variety.*	*Area in acres*	*Average yield per acre in mds.*
Paddy	Jhona 349 ,, 270	300	25
Wheat	C 281 & 273	300	18
Sugarcane	C 312 & 453	10	400
Berseem	Nil	15	400

About 340 acres are double cropped. The main rotations followed are.

Paddy — Wheat
Paddy — Wheat and gram.
Paddy — Masur (lentils)

Water.

The irrigated area by source is as follows :

Canal — 334 acrs
Wells — 15 acres
Tubewell — 10 acres

But the canal operates for about 5 months in a year. It remains dry from December to June.

During the rainy season, most of the area remains submerged under water and the crops suffer due to the water-logging. There is no natural drainage for the water of the village.

Fertilizers.

There are about 200 cattle in the village. Most of the dung is caked, dried and used for fuel. There is no forest nearly to supply fuel.

However, a portion of the dung is composted with cattleshed refuge in about 50 pits producing about 250 tons of compost per year.

Ammonium sulphate and Calcium Ammonium Nitrate are the common nitrogenous fertilizers used in his village.

Implements.

Two tractors, two disc ploughs, 20 care plough and 60 desi (local wooden) ploughs and a few minor implements are in use in the village.

There are no improved implements used for interculture or weeding or for sowing the seed in lines.

Problem Identification.

1. Water logging—inadequate drainage.
2. Saline and alkaline soil conditions.
3. Non-availability of adequate credit.

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4. Lack of plant protection measures.
5. Scarcity of irrigation water supply.
6. Lack of forest areas to supply fuel.

The group decided to take up the first problem.

Objectives.

1. To reduce the seriousness of the problem of waterlogging.

2. To improve the soil condition for higher agricultural production.

Plan of Work.

The waterlogged area in the village is about 300 acres in which normally paddy in kharif and wheat in Rabi are grown.

This problem can be solved by arranging.

1. Kachha drains.
2. Under ground drains.
3. Pumping sets to pump out extra water.
4. Selection and growing of the deep water and alkali-salinity resistant varieties of paddy.

The plan of work for the last item is given below.

What	*Who*	*Who*	*When*
1. Green manuring with Dhaincha.	Seed of dhaincha to be obtained from the block.	Farmers and the AEO.	May and June.
2. Production and application of compost and farm	Save as much of dung as possible	Farmers	Throughout the year.

What	*Who*	*Who*	*When*
yard manure.	from cakes, and making compost out of it.		
3. Sowing alkali resistant varieties of paddy.	Securing from the block the latest varieties evolved by the Deptt. of Agri. Punjab.	Farmers and AEO.	May and June.
4. Addition of molasses, pressmud, and gypsum.	From the sugar mills at Panipat and Jagadhari.	Farmers and AEO.	Winter.

VILLAGE AGRICULTURE PRODUCTION PLAN

KHAWAJA AHMEDPUR.

Introductions This group consists of the following members.

1. Shri P.C. Mehta, Chairman.
2. Shri S.D. Nautiyal, Secretary.
3. Shri S.P. Singh, Member.
4. Shri Parmeshwari Singh, Member.
5. Shri M.V. Ramasomayazulu, Member.
6. Shri A.Gopalkrishna, Member.
7. Shri V.G. Arunachalam, Member.
8. Shri V.K. Gupta, Consultant.
9. Shri R.D. Kaushik, Consultant.

Village Khewaja Ahmedpur was assigned to this group to prepare a Village Agriculture Production Plan for a segment. To proceed with the following steps were followed.

I Survey.

1. Block—Post Stage II—Nilokheri Distt. Karnal.
2. Village—Khawaja Ahmedpur.
3. Population 389
4. Families 75
   - Land owning 36
   - Tenants 3
   - Agri. labourers 34
   - Others 2
5. Total area of the village— 861 acres.
6. Total cultivated area.
   - Paddy 413 acres.
   - Maize 7 ,,

	Sugarcane.	20 acres.
	Bajra	3 ,,
	Wheat	110 ,,
	Wheat + Gram	188 ,,
	Berseem	25 ,,
7.	Alkaline soil	53 ,,
8.	Irrigation—	
	Tubewell	70 ,,
	Masonry well	75 ,,
	Seasonal canal irrigation	334 ,,

II. Need. After considering the survey data and interviewing the villagers, panches and sarpanch of the village by individual and group contacts the following problems were identified.

1. Problem of alkalinity & salinity.
2. Demand for all the year round water supply.
3. Demand for electricity to install tubewells and purchase of fertilizers etc.

Out of these problems our group decided to prepare a plan for the alkalinity and salinity problem which was the top most.

III. Objective. To reduce the alkalinity and salinity of the soil and to prevent its spread.

IV. Obstacles.

1. Lack of sufficient irrigation.
2. Lesser use of organic matter.
3. Lack of drainage facility.
4. Defective cropping pattern.
5. Lack of funds.
6. Shortage of forest and grazing land.
7. Use of alkaline and saline tolerant varieties.

V. Solutions.

A. *Mechanical.*

1. Deep summer plough.
2. Rainy season plough.
3. Flooding.
4. Med Bandhi.

B. *Agronomical.*

1. Use of salt resistant varieties.
2. Adequate organic manure.
3. Better cropping pattern.

C. *Chemical.*

1. Use of gypsum.

Out of these solutions enumerated above the cultivators agreed to implement the plan for increasing the production and use of organic matter—green manuring in particular.

VI. Procedure.

What	*How*	*Who*	*When*
1. Soil testing.	Soil testing laboratory.	Farmer & VLW	4th week April 1st meeting.
2. Preparation of soil map.	On due basis of soil testing result.	Overseer AEO	2nd Week of May.
3. Meeting of the Gram Sabha to tell them about	By fixing date in advance and announcing	Panchayat VLW	2nd Week of May.

What	How	Who	When
the problem and selection of farmers.	the same.		
4. Financial aspect.	1. Individual resources for individual plots. 2. Coop. Credit.	Sarpanch of Panchayat & V.L.W.	3rd Week of May.
5. *Supplies.*			
(*a*) Dhaincha.	Coop. seed Store.	Socy. Coop. VLW	4th Week of May.
(*b*) Sanai.	-do-		
(*c*) Glyricidia.	VLW from G.S.T.C. Ankapalli (A.P.).	Farmers.	
(*d*) Guar.	Locally.		
(*e*) Moong Ti	Agri. Deptt. U.P.		
6. *Execution.*			
1. To improve the know-how.	1. Film show. 2. Field demonstration.	Pub. Asstt. AEO & VLW	4th Week of May. Ist week of June.

What	*How*	*Who*	*When*
2. Getting the work done by the selected farmers.	Guidance & supervision.	VLW AEO	1st June to 15th July.
(*a*) Glyricidia nursery.	-do-	,,	
(*b*) Sowing of other G.M. crop.			
3. Turning of the G.M. crop.	By Mould Board Plough.	Farmer.	Before 15th July.
4. Transplanting of glyricidia seedlings.	On field Bunds at 6 feet.	Farmer.	1st and 2nd week of August after paddy transplanting.
5. Follow up.	Frequent visits. Timely operations assured and timely supplied.	Block staff.	On different spells of the growing period.
6. Evaluation.	1. Soil testing P.H.	Soil testing.	1st week of Oct, 1964.
	2. Increase in production.	VLW by crop cutting experiments.	1st week of April, 1965.
	3. No. of farmers taking		

What	How	Who	When
	up the programme.		
	4. No. of farmers convinced for adopting the practice.		
7. Publicity to propagate the programme.	1. Sight seeing. 2. Publishing the results.	Block staff.	May 1965.

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VILLAGE PRODUCTION PLAN VILLAGE SAIDPUR

Problems.

1. Electricity is not available to the farmers though it is a felt need.

2. Drainage. Lack of adequate drainage and consequent turning of the cultivated area into saline and alkaline and thus reducing the yield. Reclamation by providing drainage is a felt need.

3. Lack of adequate farm yard manure or compost manure for fields as most of the dung is converted into dung cake due to scarcity of fuel.

4. Lack of adequate credit facilities.

5. Low yield of paddy crop.

Paddy.

Area cultivated ——— 597 acres.

Improvements Suggested :

1. Improved seed—Jona 349.
2. Green manure, fertilizers—superphosphate and calcium ammonium nitrate.
3. Implements—soil turning plough puddler and paddy weeder.

1. *Seed— Jona*/349.

Every year one third of the cultivated area of 597 acres will be covered with improved seed @ 20 lbs/acre. Five acres of Village seed farm will be run and from this 200 acres of paddy area will be replaced with improved seed. For this 100 lbs foundation seeds are required every year.

2. *Green Manures.*

(*a*) Growing of green manure before the raising of nursery or after the receipt of water in the irrigation canal as the case may be. In other plans sunhemp or Daincha to be sown in May. Seeds required for 100 Acres—3000 lbs.

(*b*) Introduction of perennial green leafy manure crops

Ipomea	—	5000 cuttings in year.
Glyricidic	—	1000 ,, ,, ,,

3. *Fertilisers.*

Recommended dosage

N-40 lbs acre in 2 doses.

P205—30 lbs/acre in one dose.

Extra area to be covered in 3 years as follows.

	Ammonium sulphate or C.A.N.	*superphosphate*
1st year.	20 tonnes.	20 tonnes.
2nd year.	40 tonnes.	40 tonnes.
3rd year.	60 tonnes.	60 tonnes.

4. *Improved Implements.*

There are 20 soil turning plough for 67 cultivating families. Each family should have a plough. 47 remaining families are to be supplied with the soil turning ploughs as follows.

1st year.	16
2nd year.	16
3rd year.	15 plus replacements.

Introduction of 10 puddlers for the village—one weeder for each family.

5. *Plant Protection Chemicals and Equipments.*

The following chemicals for seed treatment and control of pests should be provided.

(*i*)	Agrosan.	G.N. 70 lbs.	per year.
(*ii*)	Endorin.	600 pints	
(*iii*)	B.H.C.	10% 6 tonnes.	

With panchayat and Service Cooperatives, one duster and spray each to be provided. Individuals to be encouraged to own sprayers and dusters.

Appropriate extension methods are to be adopted in implementing the above plan.

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ABSTRACT

PLAN OF WORK FOR VILLAGE SAIDPUR — CROP PADDY

Sl. No.	Item	Recommendations.	Materials required: Time	Materials required: Qty. or No.	Agency	Extension Method
1.	*Seed Jona 349*—	To cover the entire area in 3 years. Every year 5 acres of seed farm to be run for producing enough seed for 200 acres.	Last week of May.	100 lbs.	Block staff.	Result Demonstration besides other lectures.
2.	*Green Manure.*	To grow Sanhemp or Daincha in May in about 100 acres.	1st week of May.	3000 lbs.	-do-	-do-
		Growing perennial green manure crops—	July.	1000 cuttings.		
		(*i*). Glyrcediaa.		5000	Block staff.	-do-
		(*ii*). Ipomea.	July.			
3.	*Fertilizer.*	To supply 40 lbs N and 30 lbs of P205.	June.	20 tons.	-do-	-do-
		1st year (A.S. or C.A.N.)	,,	40 tons.	-do-	-do-
		2nd year.				
		3rd year.	,,	40 tons.	-do-	-do-
		Superphosphate:—	1st year.	,,	20 tons.	-do-
		2nd year.	,,	40 tons.	-do-	-do-
		3rd year.	,,	40 tons.	-do-	-do-
4.	*Improved implements.*	In 3 years 47 improved implements are to be introduced.				
		1st year.	June.	16 Nos.	-do-	Method demonstration.
		2nd year.	,,	10 Nos.	-do-	
		3rd year.	,,	15 Nos. plus replacement.		
		Puddlers are to be introduced for incorporating green manure in the soil.	at sowing	10 Nos.	-do-	

Sl. No.	Item	Recommendations	Materials required.		Agency	Extension Method
			Time	Qty. or No.		
		Supply of paddy weeders—one weeder for each family.	July.	67 Nos.	Block staff	
5.	*Plant Protection.*	For seed treatment—Agrosan G.N is to be supplied.	May last	70 lbs.	-do-	
		For controlling stem borers Endrine is to be supplied.	June last week	600 pints.	-do-	
		For controlling the bugs B.H.C. 10% is to be supplied.	When the attack is found.	6 tons.	-do-	

Equipments.

The following equipments for plant protection work are required at least one each in the village Panchayat & Cocp Societies.

1. Sprayer.	2 Nos.
2. Duster.	2 Nos.
Sprayers and Dusters with villagers.	5 Nos.

PROGRAMME OF ADDITIONAL FOOD PRODUCTION FROM PADDY CROP

Present level of production @ 10 Mds. per acre 6000 Mds. take 50% of increase over the present level for the remaining period of III Plan and the quantum of production for Paddy by III Plan will come to 9000 Mds. & 15 Mds. per acre.

Addition food production target from paddy crop is 3000 Mds. of paddy.

Break of the addition food target of 3000 Mds. from paddy is as follows:–

1. By seed @ 10 % 400 Mds. 1st & 2nd year.
2. Green Manure seed. 1 ton for every 10 acres. 810 Mds. 1st and 2nd year.
3. Fertilizers. 2 tons for every ton of fertilizer. 2240 Mds.

Total ....3450 Mds.

Variation taken to be plus or minus 10% *i.e.* 300 Mds.
±3000 Mds.

Area.

Paddy	482 acres.
Maize	30 acres.
Sugarcane	20 acres.
Wheat	

No. of families owning land	67 Nos.
Tenant families	43.

Total area		912 acres.
Wheat	247 acres.	Average yield. 10 Mds.
Barley	15 acres.	10 Mds.
Wheat & Gram	49 acres.	10 Mds.

Paddy	597 acres.	20 Mds.
Maize	21 acres.	15 Mds.
Jowar	437 acres.	Fodders.
Berseem	36 acres.	

Waste land that could be brought under cultivation:

(*a*). Area under alkaline and saline land required drainage 106 acres.

Area under irrigation by canal	489 acres.
-do- wells	131 acres.
Double cropped area	131 acres.
Qty. of compost or FYM produce	600 tons.
No. of cattle	429
Area green manured	10 acres.
Qty. of green manure seed	Nil.
Present qty. of green leaf manure used is	80 tons.
Other manure W.	10 tons.
P205	1 tons.
Plant protection	Nil.
Implements— Soil turning plough	20 Nos.
Triphali	1 No.
Credit (None Government).	
1963.	Rs. 11000.00

FIELD DAY PROGRAMME

The entire work for the field day programme was divided into four units.

1. Seed-bed preparation.
2. Hybrid maize demonstration.
3. Intercultural operations in sugarcane.
4. Plant protection equipment.

The participants were divided into four groups and each group was fixed up with the above items. They were shown all these operations and implements, one day in advance on the field itself so that they were in a position to demonstrate before the groups of farmers the next day.

The farmers were also divided into four groups. They came from the villages of Pujam, Khwaja Ahmedpur, Anjanthali, Saidpur, Jhanjhari, Dadupur and Butana.

The participant groups were fixed on the above four items. The four groups of farmers kept on moving from one plot to another after every half an hour. The whole programme at the field was of two hours duration.

In item No. one, the implements used were care plough, Singh Patela disc harrow and cultivator. In demonstration, the desi plough with a funnel attachment for the use of fertilizers which were being put 4″ below the surface was also shown. The hybrid maize seed was sown at 12″ distance in rows 2 apart. The fertilizers were Calcium Ammonium Nitrate and single Superphosphate. Ganga 101 was used as Hybrid maize seed.

In interculture, Singh hoe, Sharma hoe, triphali and wheel hoe were used. Their prices, sources of availability and efficiency per day were explained. First

these implements were used in the sugarcane plot by the participants, and then the farmers were involved. There were many questions from the farmers.

In plant protection, sprayers and dusters were demonstrated and explained to the farmers.

Dr. M.S. Randhawa, Special Secretary, Ministry of Food and Agriculture, and Dr. S.R. Barooah, Director of Extension Training went round all the groups. Dr. Randhawa talked to the farmers directly and asked whether they were convinced of the utility of the various implements and steps shown in the demonstrations.

After lunch, the farmers, participants, teaching staff and Dr. S.R. Barooah were in discussion session. One by one, the farmer of every village came farward with their problems that they come across in agricultural production. Scarcity of irrigation water was the main issue. In this connection, it was brought forth that many of the new tube wells have not started working because of lack of electric connections.

Waterlogging, salinity, alkalinity and inadequate credits were other problems that were brought out and discussed.

After tea, the farmers were sent back to their respective villages by means of vehicles.

VISIT TO VILLAGES FOR PROBLEM IDENTIFICATION

NAMES OF VILLAGES

Pujam, Khwaja Ahmedpur, Saidpur, Anjanthalli.

Date of visit.

Objective.

To sharpen the technique of problem identification through field observation and discussion with village leaders.

Methods of approach.

1. For complete planning, the basic data of the village population, soil, water, crops, livestock resources and land use were obtained from the registers with village level worker, patwaris and the village panchayat in addition to the interviews with progressive farmers.

2. For further identification of village problems, discussion with the leaders of the villages, individually and in groups, were held to find degree of difficulty, order of solving, length of time etc.

3. The four groups of participants visited the four villages and made field observations. They discussed with the farmers and went round the fields to identify problems. As we dealt with only those problems and factors which directly affect soil productivity, so the observations were made as follows.

(*a*) *Soils.*

Texture, structure, drainage, organic matter, fertility by examining different soil profiles in saline and good soils.

(*b*) *Crops.*

Crops grown in Kharif and Rabi, grain, fodder, fibre and oilseeds crops, crop rotation, method of sowing, seed bed preparation, weed control, and plant protection measures.

(*c*) *Water.*

Sources, amount and time available, method of application, number of irrigations.

(*d*) *Implements.*

Implements commonly used, improved implements for different operations, quantity and availability.

(*e*) *Seeds, fertilizers and plant protection.*

Improved, local, supplies, adequate and timely.

(*f*) *Farmer.*

His likes and dislikes, labour problem and managerial ability.

(*g*) *Village lands.*

Common land, area for compost pits, roads, drains, canals, fences, grazing and pasture areas, trees etc.

4. Review of problems noted by the different individuals and groups and selection of problems.

AGRICULTURAL PRODUCTION PLAN

PROGRAMME OF WORK FOR FIVE YEARS FROM 1964-65 TO 1968-69.

Basic Data.

Village	**Anjanthalli.**
Total area under cultivation.	974.00 acres.
Area irrigated by canals (only for 2½ months in a year.	725.00 ,,
No. of wells existing.	9 Nos.
Area commanded under wells.	48.00 acres.
Average area covered under each well.	5.00 acres.
Area to be irrigated with assured water supply through out the year.	926.00 acres.
Additional wells to be dug to bring the entire area under irrigation.	185 Nos.

Plan of work.

Provision of irrigation facilities has been taken up as this can be achieved in a shorter time and immediate results also can be seen by this method. It is estimated that sinking of a well with masonary construction may cost Rs. 1,500 per well and Rs. 500 extra for the instalation of Persian wheel.

A provision in the block budget has to be made under the head "loans to sink new wells" for an amount of Rs. 1,5000 every year or funds have to be set apart under

'subsidy well scheeme' so that at least ten wells can be sunk every year in this village. Each farmer may be granted a loan of Rs. 1,000 in cash to meet the cost of labour for sinking and masonary work. The money spent over and above this amount has to be borne by the farmer. A persian wheel may be supplied to him at a cost of Rs. 500. Thus the total loan of Rs. 1,500 granted to each of the farmers may be recovered in ten annual easy instalments commencing from the second year of sanction of the loan. The controlled commodities involved in constructing the well say, cement may be supplied to the farmer. The work may be programmed to be implemented in a phased manner over a period of five years to bring at least 1/4th of the area under irrigation by the end of five year. For this, to start with ten wells may be sunk in each year which will bring 50.00 acres of land under irrigation. When electricity comes, in due course, it is possible to cover the rest of the area in about 3-5 years by installing tube wells and electric motor pump sets which can be worked on a more economical basis.

With the increased irrigation facilities drainage will be a problem which has to go hand in hand with irrigation. But a large scale drainage programme for individual farmers and independent villages will be too heavy. Hence it is suggested that a planned drainage programme (master plan) for improving the drainage problems for a number of villages may be worked out and implemented by the Government.

At present out of 974 acres of the cultivated area 13,170 mds. of food grains are produced. With the increased irrigation with 50 wells by the end of five years and augmenting the local manual resources it is anticipated that the production will increase to 15,270 mds. which means an increase of 15-20%.

Along with the programme of increased irrigation facilities the local green manure resources can be increased by implementing the following.

(*i*) Planting of I pomeae carnia on the border field lands at the rate of one acre per well *i.e.* ten acres per year.

and (*ii*) Growing of green manure crops like Daincha and Sesbania, covering at least 1/4th area which will help in correcting the soil alkalinity and improving soil fertility. At least two acres of land should be sown under each new well sunk every year.

Plan of work: Provision of additional irrigation facilities.

What	*How*	*Who*	*When*
1. Sinking wells.	Providing loan.	Individual farmers with Block help.	Ten wells per year.
(*a*) Collection of applications.	Personal contact by V.L.W.	Block.	Commencing from 1964-65.
(*b*) Sanction.	As per rules.	Samithi.	June, July Before December.
(*c*) Execution.	Local resources.	Beneficiary.	January to May.
2. Green manuring.	Supply of seeds, and cuttings.	E.O.Ag. and V.L.W.	June-July.

HYBRID MAIZE DEMONSTRATIONS

L.M. Humphrey

It is well known what the use of hybrid maize seed has done in the United States where more than 99% of all maize sown is hybrid. This past year the average yield in the U.S.A. was 46 maunds as compared with 9.9 maunds in India. Part of this great difference is due to the use of hybrid seed and part is due to improved cultural practices followed in raising the maize crop in the U.S.A.

One requirement in the use of hybrids is that they be adapted to local conditions. Maize hybrids have been developed by the Coordinated Maize Breeding Scheme under guidance of the Rockefeller Foundation which are adapted to the principal agricultural sections of India. They not only have a high yielding potential, as proved by through testing, but produce a grain acceptable to the people.

Development and testing of the new hybrids is only the first step in a programme whose purpose is to have them replaced the local open pollinated varieties. The next step is to persuade the farmers to discard the local varieties and adopt the new hybrids. This is not so easy because the use of the hybrids costs the farmer considerably more money. A small part of this added cost is for the new kind of seed but most of it represents an investment in fertilizer which must be used on the crop if the hybrids are going to yield up to their potential. The extreme poverty of many Indian farmers and the difficulty in securing credit adds to this problem. However, many progressive, more prosperous farmers can adopt the hybrids as soon as they are convinced of the benefits to be had from their use.

Farmers, and perhaps Indian farmers most of all, are very slow and reluctant to change their ways of doing things, and the adoption of maize hybrids requires a number of changes. For one thing the hybrids are later in maturity than the desi varieties which means one to two weeks later harvest of the maize crop and a consequent later planting of wheat unless faster land preparation methods can be found. Other changes involving the use of better cultural practices will also be required. There will be constant resistance to these changes until the farmer becomes convinced in his own mind that it is to his financial advantage to make the changes. Then and then only will he adopt the practices required to raise a good crop of hybrid maize and sow this seed every year.

There are several ways to solve this problem of "resistance to change" on the part of the farmers. The first requirement is to convince him that by making these changes he will make more money to pay for the things he wants—a better house, better clothes, a radio, a wedding for his daughter or any one of many other things. This is an extension function and may be done by persuasion, by visual means through pictures, folders, posters, etc. and by demonstration. I consider the demonstration to be the most potent factor for convincing the farmer that he should adopt changes, provided the demonstrations are properly conducted and used.

Let us consider for a moment what a demonstration is and what it is not. In the first place it is not research. The purpose of research is to learn something not known before while the purpose of a demonstration is to show or demonstrate a fact or facts already known from completed research. For example, the researcher has learned that under a given set of conditions hybrid seed will outyield open pollinated seed by a substantial

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margin and that the use of fertilizer and other good farm practices will further increase the yield. The farmer does not know these things. He must be shown and only then will he be convinced. This is the purpose of the demonstration.

In this demonstration programme we are using a very simple, easily understood layout designed to show two things: (1) the advantage to be gained by using fertilizers and other recommended farm practices and (2) the advantage to be gained by use of an adapted maize hybrid. To accomplish this the following plan has been approved by a committee composed of members from Indian Council of Agricultural Research National Seeds Corporation, the Coordinated Maize Scheme, Rockefeller Foundation and U.S.A.I.D. (a) The demonstrations should be conducted in a limited number of districts each year and the number in each district should be kept small enough to insure good supervision; (b) Most of the demonstrations should be conducted on selected farmers' fields; (c) Each demonstration should contain three equal sized plots not larger than 1/4 acre nor smaller than 1/8 acre, selected in such a manner that the demonstration either faces a well travelled road or is readily accessable for visitors to see it; (d) Plot arrangement was to be such that the left hand plot would contain local maize grown under local practices, the middle plot would be the adapted hybrid grown under recommended practices and the right hand plot would contain local maize also grown under recommended practices.

While the primary purpose of the demonstration programme was to convince the farmers of the advantages to be gained from sowing hybrid maize seed and following good farm practices, the committee recognized that a second very important purpose could also be served.

This would be to train local extension personnel, A.E.O's, D.A.O's, B.D.O's and V.L.W's in acceptable methods of conducting demonstrations and making maximum use of them. In the process they would also observe and become convinced of the things being demonstrated.

As mentioned above the farming practices to be followed were of two kinds, local, or those normally followed by the farmer on whose land the demonstration was to be grown, and those recommended by the committee. The local practices which were to be used on the left hand plot containing the local variety of open pollinated maize need no explanation except to say that they were to be in all respects those normally followed by the particular farmer. The recommended practices, approved by the committee are those recognized everywhere as those required to raise a good crop of maize or any other crop. They are seven in number for all crops except where the seed is developed as a hybrid as is the case with hybrid maize, hybrid jowar and some others. In these cases there are eight practices.

These recommended practices are the following:

1. *Prepare a good seed bed.* This requires adequate ploughing to a depth of at least 5-6 inches and in such a way as to turn under organic matter—either crop refuse, green manure or compost. This can best be accomplished with a mold board turning plough correctly used. One such ploughing is all that is required. This should be followed by enough harrowing to break up clods and partially smooth the soil. A good planking will usually finish the job and this should leave the soil free of any weeds and in a good condition to receive the seed.

2. *Select good seed* of known genetic origin, purity and high germinating ability. In this particular case this means a hybrid breed for the part of the country in which

it is to be grown. The bag containing the seed should bear a certified seed tag giving essential information, *i.e.* name of variety, lot number, percentage of inert matter and germination percentage. The bag should also be sealed to prevent contamination.

3. *Follow an adequate fertility programme.* This means first incorporating into the soil adequate quantities of organic material either from crop refuse, green manure or compost. This is very important to maintain the soil in good condition and to increase its water holding capacity. Crop refuse or compost are best for this purpose. The organic materials should be ploughed into the soil during seed bed preparation. The second requirement is the use of adequate amounts of commercial fertilizer, N.P. and K. The amounts to be used will vary according to local deficiency conditions and according to the crop being grown. The best method is to have the soil tested by one of the laboratories to determine nutrient requirements but where this cannot be done the committee recommended that 100 lbs of N, 60 lbs of P205 and 30 lbs of K20 per acre be applied to the hybrid maize demonstrations. This represents what could be considered a minimum application, even on fertile land, to produce a reasonably good hybrid maize crop. The first application includes all of the P and K and 30 lbs of the N. These are mixed, or obtained as a mixed grade, and applied in a band two to three inches to one side and one to two inches deeper than the seed. The remaining 70 lbs of N should be applied by scattering it between the rows when the maize plants are between one and two feet high. Care should be taken not to get the fertilizer on the plants nor closer to the stalks than about 10 inches. This fertilizer should be worked into the top inch or inch and a half of soil immediately, using a cultivator or other implement. This will prevent loss from washing in case of a heavy rain.

4. *Follow proper methods of sowing.* For maize this means sowing in lines. The lines may be 24, 30 or 36 inches apart depending on equipment and local conditions. Where lines are 24 inches apart seed should be spaced one foot apart in the line. With 30 inch lines seed should be 10 inches apart and with 36 inch lines seed should be eight inches apart. More than 20,000 seeds per acre will be sown at these rates. An effort should be made to have approximately 20,000 plants, per acre at maturity. Under some conditions it may be necessary to sow at a somewhat heavier rate and then thin to the desired stand when the plants are about 8 inches high. Seed should be sown between one and two inches deep but not deeper than two inches in soil sufficiently moist to bring about immediate germination.

5. *Keep all weeds out of the field:* Weeds if uncontrolled may reduce yield 50% or more. Remember that any plant in a maize field that is not maize is a weed and is robbing the maize plants of part of their water and nutrients. Weeds should *never* be allowed to grow for fodder purposes. Weeds may be controlled with a cultivator, hoe, by pulling or by chemical means. At present hoeing is the commonest method.

6. *Control insects and other pests.* There is little point in going to the expense of sowing and fertilizing a crop and then allowing insects, birds or other pests to destroy a part or all of it. Borers and other insects should be controlled with appropriate insecticides. Borers often seriously reduce stands by attacking when the plants are quite small. It is recommended that spraying or dusting with D.D.T. or Endrex be done when the plants are about 4 inches high and before any sign of borer is to be seen. This should be repeated in 10 days or two weeks. Other insects should be controlled as necessary. Steps also

are required to protect the crop at maturity from birds, monkeys, jackals, cattle and other animals.

7. The seventh practice required for good crop production is *correct water management*. In this respect equal importance should be given to both drainage and irrigation. Maize will *not* grow under conditions of water-logging, so adequate drainage is absolutely necessary to satisfactory production. Adequate field drainage must be provided and if there are bunds around the field, these should be cut in several places to allow quick surface drainage after heavy rainfall. In addition to surface drainage sufficient sub-surface drainage should be provided to ensure that the water table will be 3 feet or more below the surface. If these requirements cannot be met then do not plant maize.

It is also very important that irrigation be provided when it is needed. Maize is a heavy user of water and the plants should never be allowed to wilt for want of moisture. When soil conditions indicate that irrigation should be provided this should be done before the plants show by wilting that they are suffering for want of water.

8. In the event that the crop is hybrid maize or any other crop of similar origin it is necessary that new seed be obtained each year and that seed never be taken from the growing crop. This is required because the hybrid originates by crossing two or more low producing inbred lines, and while the hybrid is high yielding the succeeding generations will tend to be like the parents and performance will rapidly deteriorate.

It is recommended that fullest possible extension use be made of the demonstrations. This means only one thing—that the greatest possible number of people see them or hear about them and learn the lesson that

is being taught. There are several ways this can be accomplished. First, the demonstration should be located facing a well travelled road so that a maximum number of people will pass it. Second, the demonstration should be well marked, a large sign on the road telling what it is and a small sign in front of each plot clearly telling what the plot contains. All signs should be in the local language. These two steps will make sure, not only that many people will see the demonstration, but that those who are interested may learn what it has to tell. Third, extension officials should organize field or visiting days inviting farmers from the surrounding villages to come and study the demonstration. These visiting days should be so organized that they will create the greatest possible interest in hybrid maize and every visitor should be shown the plots and have the details of the demonstration thoroughly explained. Such visiting days may be held at several key times, such as for example as when sowing is done, when the second application of nitrogen is made, at flowering time and at maturity of the green cobs and at harvest. The last two are perhaps the most important. It should be remembered that if these extension uses are not made of the demonstrations they serve very little purpose.

There is of course a fourth use to be made of the demonstrations and that is to analize the results in order to show relative yields and the benefits to be had from use of the hybrid along with other recommended practices. These results, which should include an economic analysis should be publicised as widely as possible so that they reach not only those who may have seen the demonstrations but many more as well. This is the purpose of this report. Results of demonstrations received upto April 6 are reported in the attached tables. These include results from nine States. They are Punjab, Bihar, Uttar Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Andhra Pradesh, Mysore and

Maharashtra. A total of 205 demonstrations were planned and laid out. Of these 139 were completed successfully. Floods, animals and lack of local supervision accounted for the 66 which were either destroyed or otherwise failed, or which for one reason or another were not reported in time to be included in this report.

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COMPOSITE RESULT DEMONSTRATION GUIDE

D.C. FINFROCK

The need for a well planned approach to laying and using demonstrations has led to the preparation of this guide. This is a general guide which includes broad general warnings and recommendation. It is not specific for any one area or anyone crop. The details for specific areas and specific crops will have to be filled in at the district or block level.

This guide defines and clarifies the important aspects of planning and carrying out a successful demonstration programme.

The intentions of a demonstration programme are basically two in number.

(1) To convince cultivators that they should use new methods, materials, and techniques.

(2) To teach cultivators how to use these new methods and practices.

The composite result demonstration has been used in many parts of the world to teach advanced farming methods. As the name implies, this teaching method ties together a number of improved farming practices in one demonstration to show their total beneficial effects.

To most people "seeing is believing." In other words, they require tangible evidence of the value of changing from customary ways to new ways of doing things. The old American saying of "I'm from Missouri" indicates skepticism of anything new, but also a willingness to be shown and taught that the new way of doing things is

better than the old way. A *successful* composite result demonstration provides this tangible evidence, and if used to best advantage is a very efficient teaching method.

The successful composite result demonstration is always the product of careful advance planning of the specific demonstration and of close technical supervision to see that the recommended practices are applied at the proper times and in the right way. Planned and carried out on this basis, the demonstration of well-tested research results is always successful. Only a major disaster can make it otherwise.

Attempted demonstrations which do not include the vital elements of careful planning and strict supervision, are very likely to be failures from the start. Actually, they fail to be scientific demonstration even in cases where the physical out-turn happens to be good.

The AEO or VLW working with the cultivators, of course, cannot always have all the resources he needs for doing a genuinely scientific demonstration in the strictest sense of the word. Lack of research work in his area may compel him to use information which has been found useful in other areas but has not yet been thoroughly tested out in his particular locality. Sometimes, in other words, the technician and administrator have to take calculated risks. However, it must be realized that these risks are real, and can be dangerous unless good judgement is used. They can open wide the door to failure of the demonstrations. All failures will weaken the cultivator's confidence in the use of improved practices and his willingness to rely upon the extension staff for guidance. It is therefore vitally important that our result demonstrations in the IADP be carefully planned and carefully supervised.

It should also be kept clearly in mind that it is the cultivator who conducts the demonstration. True, the VLW, BDO, or AEO will supervise, assist and advise with the demonstration. But, it is the farmer with his power source, his implements, and his abilities who must conduct the demonstration.

It must also be made clear to all field meetings or tours of the demonstrations that it has been the cultivator who has carried out the demonstration. We must be careful to give him the proper credit. This is important because it helps to convince other cultivators that they too can use these practices effectively on their own farms.

Following are some of the important points to consider in planning a demonstration:

1. *Survey Area for Change in Farming Practices that will Increase Yields.*

These may involve the use of an improved variety, high quality seed, better prepared seedbed, higher fertilizer rate, better plant protection, timelier planning, better seed and fertilizer placement, timely application of watei, etc.

2. *Research Information.*

The research information which is available on the practices to be changed should be carefully reviewed. Great care should be taken that all recommendations are based on sound research and testing done in the area in which you are working. The assistance of the State and Centre Specialists can be of great help.

3. *Personnel to be Involved at the Planning Stage.*

What people should be involved? Certainly in the planning stage, the most experienced people available in the District, State, and Centre should be involved. Research as well as extension personnel with background

and experience in developing recommendations for improved farm practices should be consulted. Experienced AEOs, BDOs and VLWs as well as some of the more progressive cultivators may be useful at the planning stage. Care must be taken to keep this group down to a workable size. A group of fifteen would be maximum.

4. *Selection of the Cooperator.*

The selection of cooperators in a demonstration programme is of prime importance. The cooperators should be cultivators of average ability. They should be people who are respected by their neighbours and whose counsel is respected. The cooperators should be those who can be convinced of the value of successful demonstrations and be willing to adhere to the demonstration plan in regard to both the treated plots and the check plots. A complete realization of the value of comparison must be had by the cooperator and his family, so that they will not deviate from the plan and provide improved practices for the check plots. A successful cultivator who is not concerned with the welfare of the community or whose counsel is not respected by other cultivators is of little value to the programme.

5. *Plots Size & Location.*

The size of the demonstration plots is very important. They should not be so small as to raise doubts as to the feasibility of handling such practices on a larger scale. Neither should they be so large as to present problems in supplies, management, and supervision. A one-half acre plot with half of it farmed by the usual methods and the other half farmed with improved or recommended practices should take an excellent demonstration.

Plots should also be placed near a well-used road or path so that they can be seen by many people, and are

easily available for field meetings. The treatments should be at right angles to the road or path.

6. *Soil and Water Consideration.*

The demonstration plot should be favourably placed in regard to soil and water. The soil type should be well suited to the crop involved. The plot should be so located that water delivery and drainage of excess water are assured and can be reasonably well controlled. The benefits from most of the improved practices cannot be realised without a fair amount of control over water supply and drainage. The plot should also be in an area with average production potential. If a highly productive area is chosen it will be very difficult to visibly demonstrate the superiority of the demonstration plot. In an area of very low productivity there is bound to be some limiting factor which cannot be controlled.

In areas where some problems are anticipated in regard to soil or irrigation water (for example salinity or alkalinity), a greater number of plots than are actually required should be chosen well in advance of the crop season. Soil and water samples should be collected and sent to the soil testing laboratory for checks, and than the most suitable plots chosen for the demonstrations.

7. *Determinations of Lime and Fertilizer Requirements.*

Composite soil samples should be collected from the demonstration plots at least six weeks prior to the cropping season. They should be sent as 'special priority' samples to the soil testing laboratory and a lime and fertilizer schedule should be drawn up for the plot based on the soil tests. A time-table for this work should be drawn up in consultation with the soil chemist in charge of the soil testing laboratory.

8. *Obtaining and Storing Supplies.*

An inventory of the necessary supplies of seed, fertilizer, pesticides, implements, etc., that will be needed in the demonstration programme based on demonstration plans should be procured and stored where they are readily available. This is a very important part of the planning phase. The quality of the seed of the improved variety to be used must be carefully checked. The desirable physical condition of fertilizer and pesticides must be assured and maintained. Implements must be inspected and checked to insure that they are in working order. These are things that must be done prior to the planting season, and far enough in advance so that no shortage or delays occur at critical times.

9. *Time and Method of Seedbed Preparation.*

Seedbed preparation must be started early enough so that seeding and planting can be done during the optimum planting period. The methods of seedbed preparation used must be those which will give the best possible seedbed for the crop. Considerations must be given to moisture retention to insure good germination and growth in the seedling stages. The texture of the seedbed must be fine enough so that precise placement of seeds seedlings and fertilizer is possible.

10. *Methods to be Used.*

Amounts of seed to be planted per acre, methods of planting, transplanting, fertilizer application, plant protection practices, and cultivation must be planned in advance so that the cooperator will know what is to be done at each stage of growth, and how to do it.

11. *Timing of All Improved Practices.*

Timing is the key to success in the production of crops. This is an exacting science and requires specific

knowledge of all practices used in farming. The degree of success attained is usually due to a knowledge of timing. The plant is the all-important factor in this process. Seed must be planted so that germination, growth, flowering, and maturity occur during the most favourable seasons for the variety of the crop being grown. In applying fertilizer we must be sure that the nutrients needed are in available form in the soil at the proper time for optimum growth and yield.

Plant protection practices must be carried out before weeds can rob the crop of water, nutrients, and light, and before insects, birds, animals, and diseases can damage the crop. Water must be applied so that the crop never suffers from drought or from excess moisture. A carefully planned time table must be worked out and adhered to if we are to realize the best results from practices used. Occasionally, it will be necessary to take emergency measures to combat some unforeseen problems.

12. *Supervision Needed.*

It will be necessary for the extension personnel responsible for planning these composite demonstrations to work closely with the cooperative cultivators and provide assistance for the practices he is unfamiliar with. This will require frequent visits to the demonstration plots when the crop must be examined closely to determine its general well-being. Does the crop have adequate moisture? Are there any symptoms of nutrient deficiencies? Are the weeds being properly controlled? Are there any signs of disease? Are there any harmful insects present? What is the limiting factor most evident and how can it be remedied? To answer these questions correctly requires a good degree of technical competence.

13. *Number of Inspection Trips and Note Taking.*

Periodic inspection trips should be planned and careful notes should be made on the progress of the crop. These things may be done in conjuction with supervision. Information that will be useful for future reference is germination of seed, plants per square foot or foot of row, height of plants at a certain number of days after planting, tillering period, numbers of tillers, heading time, fruitful tillers, head size, timing of protection practices and any special problems. A check should be made to ascertain if the farmer also applied the package of practices on the control (farmer-practice) plot.

14. *Field Meetings to be Held.*

The number of field meetings desired will depend on the practices being demonstrated. Some suggestions regarding field meetings would be as follows:

1. To demonstrate a better crop stand due to:
   (*a*) Improved seed-bed.
   (*b*) Seed treatment.
   (*c*) High quality seed.
   (*d*) Combinations of above.
2. To demonstrate better growth due to:
   (*a*) Green manuring.
   (*b*) Composting.
   (*c*) Use of chemical fertilizers.
   (*d*) Use of improved crop variety.
   (*e*) Fertilizer placement.
   (*f*) Line planting at specific depth.
   (*g*) Proper irrigation and adequate drainage.
   (*h*) Combinations of above.
3. To demonstrate effects of proper pest control:
   (*a*) Timely weeding.
   (*b*) Preventive insecticides.
   (*c*) Proper dusting and spraying programme.

4. To demonstrate visual improvement of yields due to :

(*a*). Total of above practices.

We are interested primarily in composite demonstration using many of the above mentioned practices. However, several field meetings to teach the methods used and to show the results of improved practices.

15. *Harvesting and Threshing Methods.*

Plans must be made for the methods to be used in harvesting and threshing both the demonstration plots and the comparison control plots. Harvesting should be done as soon as the crop is mature. Frequently the two plots will mature at different times. This will mean that one must be harvested as part of the demonstrations, care must be taken to avoid share harvesting where the harvester takes a percentage of the crop. If samples are to be cut from the plots, then they should be representative samples. Four to six rows from the centre of each plot could serve as representative samples. Arrangements must also be made in advance so that threshing will be done in a timely manner and the crop put under cover. Grain bundles can be damaged by birds, rodents, domestic animals, or foul-weather so that a season's work is greatly reduced in value or destroyed in a few minutes.

16. *Measurements and Records.*

A well-planned, carefully managed demonstration can be of value long after harvest time of permanent records of field notes and measurements are kept. Some of the permanent records that should be kept are:

1. Dates of seedbed preparation.
2. Practices used in seedbed preparations
3. Soil testing information
4. Dates when manures or green manures were applied

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5. Date of fertilizer application
6. Kinds and amounts of fertilizer applied
7. How the fertilizer was applied
8. Lime application (if used)
9. Seeding rate
10. Date of planting
11. Dates of weeding or interculture
12. Dates of application of insecticides, and kinds and amounts used
13. Dates of irrigation and amounts of water applied
14. Rainfall—dates and amounts
15. Date of harvesting.

These measurements could be usefully made on the composite result demonstration plot and on the control plot.

1. Plants per square foot
2. Height of plants at various stages of growth (*i.e.* 3 weeks after planting, tillering, heading, maturity).
3. Dry weight of plants from one square foot area at above stages of growth.
4. Number of tillers per plant
5. Average number of heads per plant
6. Average number of kernals per head
7. Yield of dry grain per unit of area

Well made photographs and colour slides can be very helpful as visual aid materials, if photographic equipment or services are available.

17. *Economic Evaluations.*

It is of utmost importance that careful accounts of all supplies, labour, implements, etc. be kept. Cost accounting must be done for the control plot as well as the demonstration plot, so that comparisons can be made.

Seed, manure, compost, fertilizers, pesticides, water, labour, etc. must be priced at the level the farmer pays. The total cost of production on the demonstration plot will be greater than that of the control plot, but if the demonstration is a success the per unit production cost will be less. Thus, it will cost less to produce a maund of wheat, rice, jowar, maize, etc. on the demonstration plot than on the control plot. This is an important measure of your success.

18. *Post Harvest Meetings and Reporting.*

Every opportunity should be taken to inform the cultivators of your area of the results of a successful composite result demonstration. This can be done through meetings, tours, posters, slides, photographs, exhibits, motion pictures, radio and newspaper publicity, and other applicable means of spreading the word.

19. *Experience and ability of Individuals Supervising Demonstrations.*

The experience and ability of the people involved in supervising demonstrations must be considered. An AEO with five years of experience will certainly be able to effectively supervise more demonstrations than a VLW just out of training.

20. *Demonstration work assigned on the basis of Individual Ability.*

If demonstrations are to be assigned than the individual ability of the extension worker must be evaluated along with his already existing duties before assignments are made. (One good demonstration is far better than 10 poor ones).

The scientific composite demonstration method of teaching is very effective when used properly.

Those who lack experience in using the composite type of demonstration should employ only three or four improved practices at a time. The use of high quality seed of an improved variety, planted in a better seedbed, with a moderate amount of chemical fertilizer, and with adequate pest control would be a good composite demonstration in many areas and for most crops.

In the past season, there have been a number of abortive demonstrations that have not demonstrated improvements over the control areas owing to lack of planning and guidance. We cannot afford to waste valuable time and materials on such operations. They can never do the real training task, but they can cause the cooperator and neighbouring cultivators to lose faith, and will certainly complicate the job of teaching the use of better farming methods. Therefore, the utmost care must be taken to insure that those who plan and perform demonstrations must do the job well. Emphasis should be placed on the quality of the demonstrations. The number of demonstrations is important, but their quality is even more important.

This guide plus a careful planned training programme in the field for those at the field level should help us do effective demonstration work.

INFORMAL COMMENTS BY MR. ORVILLE FREEMAN, SECRETARY U. S. DEPARTMENT OF AGRICULTURE

Thank you very much for this generous introduction. I bring greetings from President Johnson, from the people of United States and particularly from the farmers of the United States to you and your colleagues the pioneers who have gathered here in this Training Centre. I have, as you know, just arrived from New Delhi and I have been observing many things of this very very ancient and beautiful land of yours along the way.

I could not help thinking how much wisdom has accumulated here over the ages when I compare this ancient land with our country or as it is sometimes called the new world. The United States is a new land as compared with India and yet together we are equally, we may say, pioneers working to open what President Kennedy called the 'new frontiers'.

The new frontiers are not the frontiers of new land since most of the worlds' lands have been chartered. Certainly the new frontier and the new possibilities lie in the knowledge, the know-how in the field of science and technology and in the understanding of the physical world around us. Certainly our scientists aie opening increasingly new horizons and showing us the new pastures in these new frontiers. In these new horizons, we are beginning to see how much this can mean in terms of a better world for all mankind. We are beginning to realise that people do not have to be sick, that people do not have to be hungry, and that people do not have to be cold. Potentially we are living in this whole world with a new frontier in a new age which we may call an age of abundance and yet throughout the ages man has

lived in a world of scarcity. We are now learning that there can be enough to go around and so it surely is a new frontier, a new frontier in India, a new frontier in the United States and a new frontier all around the world in terms of meeting new world aspirations.

It does not do much good to know about these better ideas and methods unless they are put in practice unless the people are able to use them. In many ways it is much more difficult, I think, to get ideas to the people that are usable than just to discover this information in the abstract. I think Einstien was asked on one occasion how was it that man could learn physics and other sciences of the world and develop and use these complicated concepts but yet have mankind continue to struggle with one another all around the world. And he said that the answer was very simple; because politics is much more difficult than physics. This new frontier, of course, in the broader sense is the politics of living together, of human relations, of humanitarianism and of our concern for fellow human beings, of trying to understand and to impart this knowledge so that it will be usable. That is not simple. It requires the best of new techniques, the greatest of dedications and the greatest of our love in terms of interest in our fellow human beings.

So you have gathered here in this institution with great responsibility. It is a great challenge to take this knowledge which is available, more of which you are learning and some of which you are trying to learn in order to eventually carry this knowledge to the cultivator in the field, like some of those farmers whom I visited while driving from New Delhi this morning. I tell you that this is a new area, this kind of extension communication.

It is sometimes thought that in the United States agricultural productivity was always at its present level

and that we were always fortunate on the United States. Really it has only been in the last 40 years that we have made tremendous progress in the field of agricultural productivity in the United States. The extension service in the United States has been in existence only since 1914. Today there are still many initial pioneers, as you are today, who first started the extension service in the United States. Starting extension work and talking to farmers about these new techniques and new knowledge was one of the great cooperative leaders in the United States by the name of Marian Lincoln. You might have heard of him at one time or the other, he is now the President of a great Cooperative Nation wide Insurance Company. He was one of the extension agents in the United States. He invited a farmer in New England, who told him that he would be run off the land more often than he would be listened to. In other words farmers would say who is that young lad who comes here to tell us how to operate our farms. We have been farming for more years than his age. I mention this by way of illustration and it is how this new extension service has been in the United States.

What you are doing today is a pioneering endeavour and in the process you are bringing the technical know-how to the cultivators in the fields so that they are able to improve their standard of living, live a better life and contribute to this country and to the world. And this can be done. There is no reason today why any man. woman or child need go hungry anywhere in the world. We have the resources and the know-how, but having them is not enough. The more difficult task is to impart this knowledge to the cultivator making it possible for him to apply and use the new techniques.

I wish you well in your great endeavour. I am much impressed by the progress you have made and with the drive, spirit and dedication that I have seen. May

I predict with some confidence that the progress you have made is only the beginning and the knowledge you have will be passed on more rapidly to those who need it, toward the goal we all seek to build a better and peaceful world for all mankind. May I contribute in a small measurs to that objective? I am sure you have had occasion to refer to these volumes, not that they bring something fresh and new but perhaps they might add just a little. These two volumes are the new Agricultural Statistics 1963 and the Yearbook of Agriculture 1963. Thank you.

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